Flight

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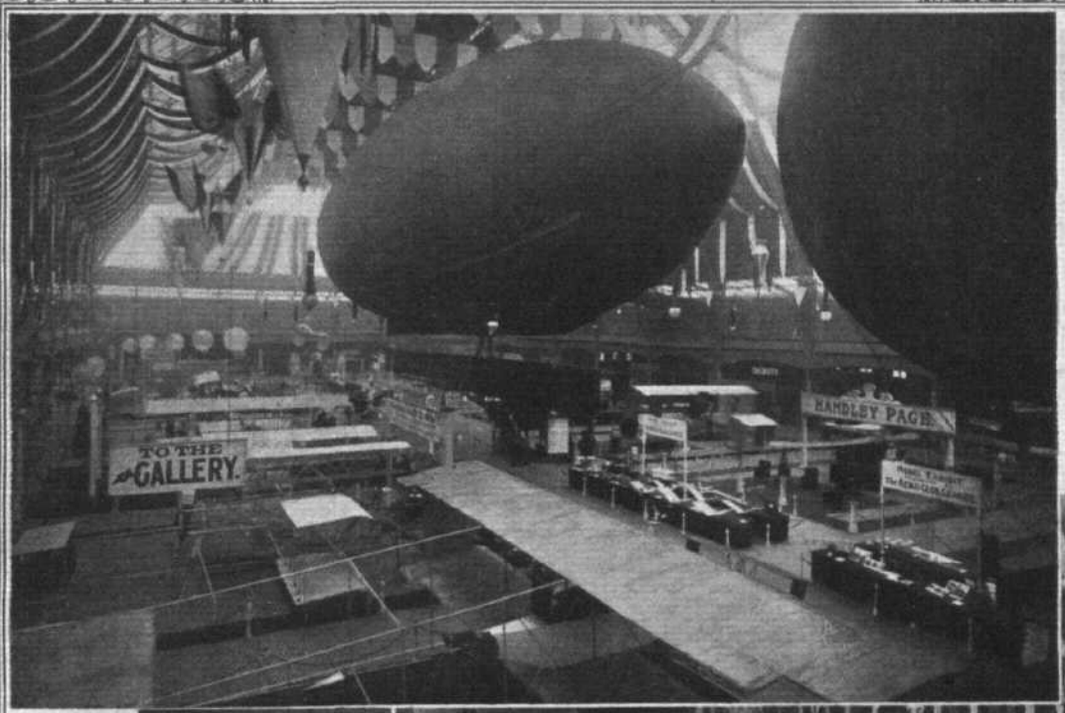
Events box mag 1



Events box mag 2

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AERO SHOW AT OLYMPIA.—Two general views of the exhibits from either end, showing the Wellman airship in the centre, and the Continental and Messrs. Short Bros.' balloons at either end, the flying machines being ranged round these, with the models arranged by the Aero Club League down the centre of the hall.

FLIGHT.

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THE SIGNIFICANCE OF THE SHOW.

THE exhibition of flying machines that will close at Olympia, Kensington, to-night, has proved a success on more counts than one. Firstly, it has drawn the attention of the public to the subject of flight in a very practical and attractive fashion. The visit of the Prince of Wales during the week was of material aid to the patriotic aim of the Society of Motor Manufacturers and Traders and the Aero Club. Colonel Capper also did all that was in his power to ensure the display being taken notice of by the military authorities, and, by the sending down of a detachment of members of the Balloon Section, the public was given a hint of the fact that at least there are sections of our military organisation that do take a ply in this matter. It was likewise helpful to find Mr. Cody's military kites included in the display, for his severest critics cannot gainsay that in this department of investigation he has arrived at a highly gratifying degree of practical success. In regard to the nature of the exhibits —to which we refer in full elsewhere—it is pleasing to note that both directions of development were represented; while not the least surprising feature of the Show was the keen and intelligent interest displayed in it by many ladies who put the most pertinent questions concerning features of mechanical construction.

The Exhibition is bound to mark a turning point in the history of flight in Britain. For it is without precedent, and it has been possible only through the combined enterprise, patriotism and far-sightedness of the Society of Motor Manufacturers and Traders. If we are to realise precisely what is the value of the service rendered by that body we must turn back the pages of history to over a decade ago and recall the circumstances under which the motoring movement was officially introduced to this country. The result of any such comparison leads directly to one conclusion only, namely, that the flying movement has been launched under vastly more favourable auspices than attended the heralding of the horseless vehicle, which was introduced in the guise of a side show, whereas the most suitable exhibition-building within easy reach of London was taken for the purpose of the Show now closing, and no pains and expense were spared in drawing the attention of the public to the fact that such a display was open for their inspection. Thus, even as the petrol engine has brought practical power-flight quite quickly within the sphere of modern engineering achievements, so the representative trade body of the motor industry in these islands has introduced designers and builders of flying machines to the notice of the public and the official world, for it must not be overlooked that some of the most representative and influential men of our times have availed themselves of the opportunity for making acquaintance with what manner of contrivances it is possible for men to fly withal. In this connection, perhaps the chief lesson of the Show has been the illustrating of the fact that practical flight can never be confined to any particular system or design exclusively; but that as we progress it will be possible to journey in mid-air by as many varieties of machines as there are vehicles in use for land travel. Therein lies great promise for the healthy future of an incipient industry.

Happily the inaugural luncheon proved to be no merely formal function, for many of the speakers let fall words worthy to be pondered. Thus, Mr. Roger Wallace, speaking as chairman of the Aero Club of the United Kingdom, did well to utter a public warning concerning the undesirability of hampering the new industry by asking the public to subscribe to companies or syndicates promoted with large capitals. The time is not ripe for going to the public on any proposition in regard to flying machines. The proper way to set to work is to organise private syndicates with just sufficient money for the purpose of carrying the essential investigations preliminary to establishing any given system on an indisputably practical basis. When any really successful type of flyer shall have been evolved as the result either of such a procedure or of individual investigation and finance, there will not be wanting those individuals whose co-operation and capital will establish the developed machine on the basis of a manufacturing and commercial enterprise. Past experience of various branches of engineering and scientific industry during the last half century is such as to leave it beyond a matter of doubt that the professional company promoter will not fail to seize on human flight, and to bait the public imagination with his wares. But those who have the true welfare of the movement at heart will do well to be ever on the alert against his machinations, and to spare no pains to defeat the purposes of a class of parasite that may very easily succeed in retarding the normal growth of the movement for very many years, if he is allowed to play anything of a prominent part in it during what may be termed its probationary period.

We must look to the educating of the great British public, however, for the most practical assistance of all; for until it is brought to such a pitch that it begins to make its opinions felt, we can scarcely hope to see the more or less spasmodic efforts of poorly equipped and untrained inventors and investigators superseded by good scientifically directed work such as alone can place flight among the recognised branches of latter-day engineering. That is necessary if Britain is to take the same rank in airmanship as she did in seamanship. And these facts remind us that, in respect of these developments of modern life and activity with which we are alone concerned in these columns, all who have the interests of flight at heart must relax no effort to keep the actuality of it, and the possibility of it, before the notice as well of the Government as of the people.

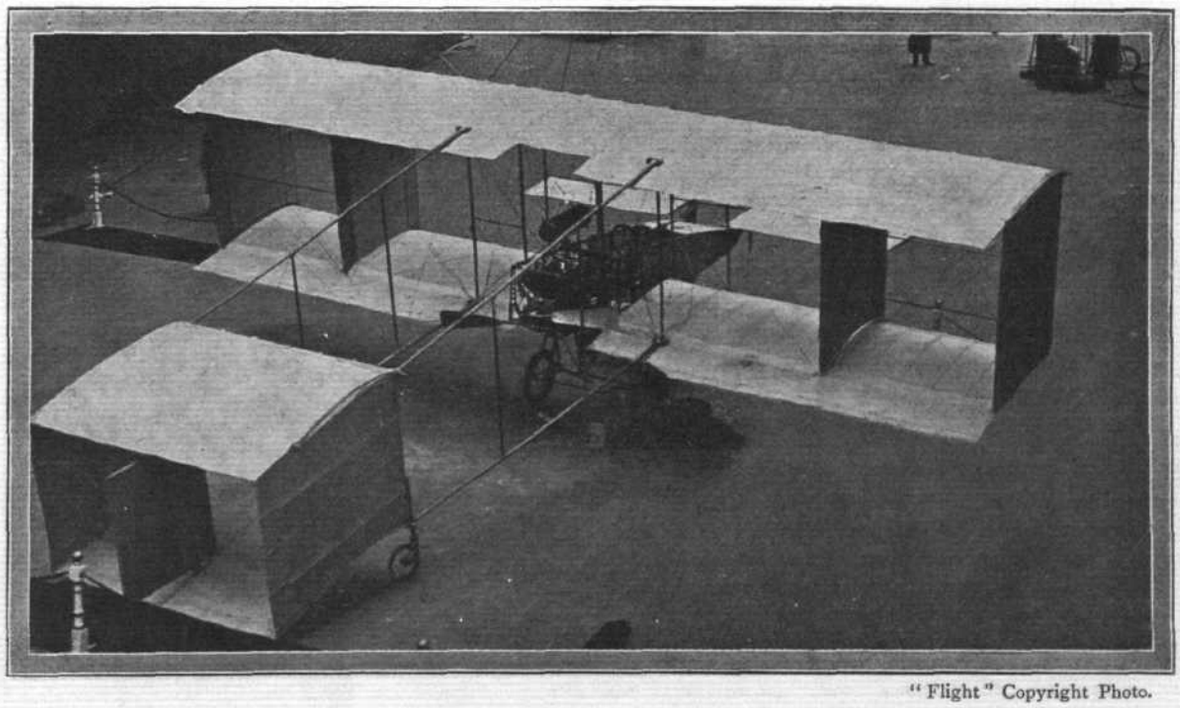
THE FIRST BRITISH AERO SHOW.

THE First British Aero Show organised by the Society of Motor Manufacturers and Traders, supported by the Aero Club, which opened on Friday, March 19th, and closes to-day, Saturday, the 27th instant, has in no way belied our prognostications of its interest and importance. It is a real show from end to end, and, having regard to the fact that it is the first of its kind in this country and is being held within but a few months of the daybreak of the new era, it is a most extraordinarily fine exhibition of flight.

That most visitors to Olympia hold this view is confirmed by the one or two marked exceptions which may at times be overheard while strolling along the gangways. They are expressed by the sort of person who is discontented on the slightest provocation, and who, moreover, seems to have a woeful lack of mental ability wherewith to form a judgment. What, we would ask, do such as these expect? And under what conceivable conditions could they have been induced to accord approval which would be of any worth whatever? Do they want more machines, or do they want flyers which are not there? Olympia is a large hall and it is well filled; and, besides, it would be difficult to believe that the malcontents could appreciate other models if their wish were to be gratified.

There is, it is true, much cause for disappointment that the first British show should be without a Wright flyer, but we cannot conceive that its absence makes the other machines less interesting, or that those who think them so on this account would be able to look upon a Wright with any real appreciation. One or two have been heard to say that the show was not as good as that at Paris, and it is true that there are not the same number of machines on view. But what there are, are more attractively arranged; and the show itself is more obviously related to flight than was the first Paris Aero Salon, in which the effect was spoiled by the occupation of the Grand Nef by industrial vehicles. There are at Olympia 11 full-sized flyers, while at Paris there were 16, including Ader's "Avion," from the Arts and Metiers Museum, and Santos Dumont's "La Demoiselle," which was hung out of sight. Besides the Wright, the only other flyers which were at Paris and are not at Olympia are the Bleriot, Antoinette, Vendôme, Clement, Kapferer, and Lejeune. Voisin's machines are well represented, for not only is Mr. Moore-Brabazon's own "Bird of Passage" on view, with its Issy mud-stained wheels, but Messrs. Simms (the Voisin concessionaires in this country) show a similar model, and the Mass Cars exhibit a Delagrange, which is of the same make. There is also the R.E.P. monoplane, which is shown by Messrs. Bessler-Waechter, and it is well that the show is not without a successful model of that pattern, although it lacks the Bleriot and the Antoinette, which, of late, have been more particularly successful. Two other machines from France are the Breguet and one built by Pischoff for Captain Windham, who has entered the commercial side of the business. The Breguet, shown by Mr. Stenbury, is a biplane of quite a different type to the machine exhibited in Paris; the same remark applies, moreover, to the Pischoff.

Where the present show gives so much cause for especial satisfaction is in the presence of the British section, and the high standard of workmanship which it has set. Short Brothers and Howard Wright show biplanes built in wood and steel respectively, and each is unquestionably a first-class example of careful construction. The same can be said of Messrs. Lamplough's work, although the machine is unfinished; and we trust that Messrs. Handley Page, who are not now represented by anything that they have done themselves, will follow



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AERO SHOW AT OLYMPIA.—Mr. Moore-Brabazon's "Bird of Passage," the actual Voisin flyer with which he has been making successful experiments in France. The engine now fitted on this machine is an 8-cylinder E.N.V.

the good example which is set in this respect by their contemporaries. Opinions may differ as to the correctness or otherwise of an underlying principle, but surely none will be found to dispute the necessity for putting the best of work into the construction. "If a job is worth doing at all, it is worth doing well" is an essentially British saw, and it applies to flyers perhaps even more than to motor cars. Eighty miles an hour on *terra firma* seems comparatively safe when regarded from the point of view of a voyage in one of these aerial caravans into the central blue. The poetry of motion it may be, but characterised by a halting metre, we should imagine, when experienced by an occupant who has any cause to know that he is seated on a rickety structure. Besides, it is impossible to test a principle in a flyer of indifferent construction, so that really a pioneer is risking his neck for very little purpose if he goes up in a shoddy machine for the sake of saving his pocket. British workmanship is world renowned, and all flyers which are built here will, we hope, be a credit to their country of origin in this at least, let which may fly best.

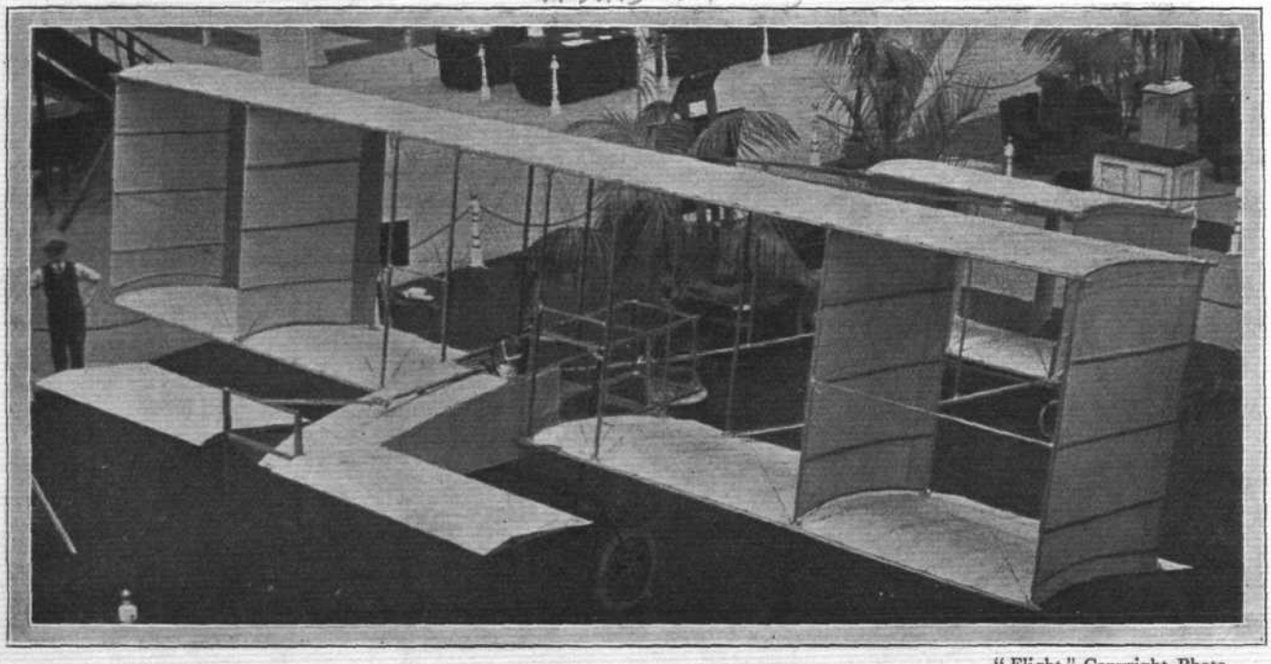
While the majority of the flyers exhibited are of the aeroplane type, there are one or two machines to which special reference should be made; one is the structure exhibited by Messrs. Lamplough, and the other device designed by M. de la Hault and shown by Messrs. Miesse. Both are described and illustrated elsewhere, together with particulars of the other machines which are on exhibition. To the models, it is unnecessary to refer in any great detail at the present moment, since these also will be dealt with in a future issue of FLIGHT, but inasmuch as there is no actual Wright machine present, it is only fair to point out that Messrs. T. W. K. Clarke show a well-finished model of the famous flyer, and have, moreover, installed a starting derrick on the same scale. This latter, at any rate, could not well have been exhibited in full size, so the Clarke model certainly deserves the interest of all visitors.

Of equal importance to the flyers themselves are the aero motors with which they are equipped, and the engines at Olympia will naturally appeal with especial force to motorists, who, because of their training, will be able to appreciate their points. As in the case of the flyers, so also is it gratifying in this to see that the aero motors make a representative group, and more particularly that they include a strong British contingent. Moreover, this latter is recruited from the ranks of prominent constructors in the automobile world. There is, for instance, the Wolseley Co., who have produced an 8-cyl. V-type engine, and Messrs. Simms show a motor of the same class but with only 6 cyls.—which is an unusual number with the V arrangement. The N.E.C. Co. have made a radical departure which is of distinct interest and importance, for they have tackled the two-stroke cycle problem, and have introduced a new principle to aid in its practical solution.

Another aero motor into which much real individuality has been embodied, but without departing from the orthodox four-stroke system, is the Green engine, which has been built by Messrs. Aster at their English works. It is a model of attention to detail in design, and it gives every appearance of having received that sound construction which would be expected from the Aster works.

A rotary engine has been placed on the market by the International Rotary Syndicate, and in the same category is the Gnome motor, shown by Messrs. Gauthier, from France. On the U.M.I. stand is a turbine designed by M. Tani, who constructed that extraordinary model flyer which was illustrated and described in *The Automotor Journal* of February 16th, 1907. The turbine is so small that it can be grasped in the hand, but it is said to be capable of developing from 16 to 20-h.p. when running at 10,000 revs. per min.

Among the more orthodox types from abroad are the Metallurgique engines (shown by Messrs. Warwick Wright), which have been designed on precisely the same lines as the famous car engines of that make, but with lightened parts and a specially high-pressure system of lubrication. Another standard type of vertical engine is the Vivinus (Erard, Van Toll), which was used in some of Mr. Moore-Brabazon's flights; but on the whole the V pattern seems to be the more popular design for



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AERO SHOW AT OLYMPIA.—The Voisin machine, exhibited by Mr. F. R. Simms, seen from in front. This illustration gives an excellent view of the elevator, and of its inter-connection with the controlling lever. The engine and propeller are not fitted.

aero motors, and it is to this pattern that the E.N.V. (London and Parisian Motor Co.), the Pipe (London Motor Garage), and the Renault (Renault Frères), belong. The principle of opposed horizontal cylinders is adopted in the design of the Dutheil-Chalmers engine, which Capt. Windham exhibits; and the Miesse aero motor belongs to the horizontal radial type, the crank-shaft in this latter case being vertical. The Gobron aero-motor represents the letter "X" in appearance, and embodies the well-known Gobron double-piston principle, and the R.E.P. (Bessler-Waechter) engines, as our readers know, belong to the semi-radial type. For models and small experimental work generally, Messrs. Ripault exhibit a specially light motor of 1¼-h.p., which is water-cooled. These will be illustrated and dealt with more fully in next week's issue of FLIGHT.

At present, what may be described as the accessory section of an aero show has not developed to any great degree of magnitude, although its importance is hardly less on that account, since such goods as come under this heading are in the nature of essential appurtenances for a flying machine. There is the surface material for instance; no flyer can fly without a suitable covering to its framework, and we anticipate that, as the art progresses, so will this department of the trade expand. At present it is in a few good hands, the best known in this country being, of course, the Continental Tyre and Rubber Co., of whose fabric full particulars were given in FLIGHT on January 30th. Newcomers to this country are the Hutchinson Co., who have, however, had some two years' practical experience with their aero cloth in France, where they are contractors to the Government. Of their wide range of materials full particulars will also be given in an early issue of FLIGHT. The Rub Metal Co. also exhibit aeroplane fabrics which are made in France.

Propellers are for the most part constructed by the manufacturers of the flyers, but Messrs. Ludw. Loewe and Co. have taken up the agency for the wooden Helice Integral, while the Beedle propeller on the International Rotary Motors stand and the much-talked-of Hollands propeller on the N.E.C. stand are also among those which may at present be described as unattached. Radiators are shown by the Motor Radiator Manufacturing Co., who make the Zimmerman Radiator, Brown, Hughes, and Strachan (Crown Radiator), and by Messrs. Lamplough; who have evolved a particularly light design. Messrs. Rubery Owen are making a speciality of tapered oval section steel struts for biplanes, and the Steel Barrel Co. undertake the construction of special petrol tanks. Leo Ripault and Co. exhibit a substitute for aluminium which they claim to be an entirely new metal, and to possess remarkable properties.

Special woodwork, outside the exhibits of complete machines, is not in great evidence, but Messrs. T. W. K. Clarke have a collection of Burgoins hollow spars which are distinctly interesting.

Last but not least there are the numerous beautifully made instruments exhibited by Elliott Brothers, who have all sorts of devices calculated to assist the experimenter in collecting accurate data as he progresses in the art of flight.

As in connection with the Paris Aero Salon, each exhibit of importance will be dealt with separately by us, but the foregoing *résumé* will serve as a comprehensive indication of what Olympia contains.

There is, of course, another section of the Show besides that dominated by the flyers and their appurtenances. There is that department of aeronautics which is not heavier-than-air, but the exhibits representative of this side of the movement are not extensive although in the presence of the Wellman airship they are doubtless far more interesting than might have been expected. The Wellman airship is the vessel with which a fruitless attempt to reach the North Pole was made two years ago from Spitzbergen, and with which another effort in the same direction is impending, at the moment when the news comes to hand that Lieut. Shackleton has almost reached the South Pole, another triumph, it may be assumed, for the motor car. Of the spherical balloons one is made by the Continental Co. with their special fabric, another by Short Brothers, and there are other details of balloon and airship equipment shown by Spencer Brothers.

Special engines for dirigibles are shown by Messrs. Clement-Talbot and the Wolseley Co.; the former motors being of the same make as those used with the Bayard-Clement airship purchased by Russia, and in the Italian military dirigible.

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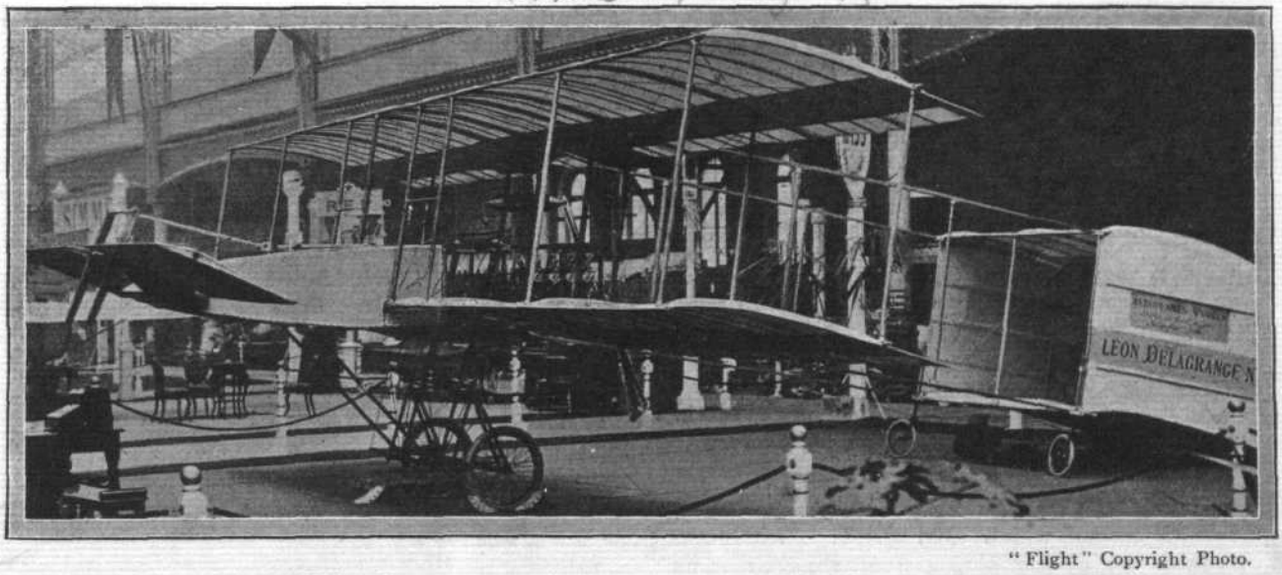

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AERO SHOW AT OLYMPIA.—General view of "Delagrange No. V," which is exhibited by Mass Cars. This flyer is of Voisin construction, but has no side-curtains between the main planes, which are themselves less far apart than on the latest Voisin machines.

FLYERS AT OLYMPIA.

IN the following paragraphs the flyers on view at Olympia are described separately, their salient features being pointed out, and an explanation being given of the purpose for which such leading details have been devised. In a future article we purpose taking these features collectively in order to compare them. No attempt, therefore, has been made this week to introduce comparisons into the descriptions themselves. In an accompanying table we have summarised the leading data relating to these machines, and have included, in addition to the selling price, a column to indicate whether or no any guarantee is offered to the purchaser, and it is perhaps not the least remarkable feature of this first British Show that practically every constructor was cheerfully willing to commit himself in this respect, most of them stating that the flights accomplished would be to the satisfaction of the purchaser before he need take delivery. In other cases a definite distance was agreed upon, as, for instance, with the Rep monoplane, for the demonstration of which, however, the buyer must journey to M. Pelterie's aerodrome at Buc, in France. A notable exception in this matter of guarantee is that of Short Brothers, who, while declining to guarantee what they have not yet tested personally, are nevertheless quite prepared to make reciprocal arrangements with the purchaser of a thoroughly sporting character.

FLYERS AT OLYMPIA.

Name and Exhibitor.	Country of Origin.	Spread.	Surface.	Weight.	Engine. Make.	Engine. H.P.	Engine. Cyls.	Price.	Guarantee.
Biplanes.		ft.	sq. ft.	lbs.				£	miles
Short	B	40	520	360	Green ...	30	4	—	—
Howard Wright ...	B	40	620	1,100	Metallurgique	60	4	1,200	S
Voisin (Simms) ...	F	33	537	1,100	Simms ...	50	6	950	3
Voisin (M.-Brabazon)	F	33	537	1,250	E.N.V. ..	80	8	—	—
Delagrange (Mass) ...	F	33	537	1,100	Antoinette ...	50	8	—	*
Pischoff (Windham)...	F	35	495	530	Dutheil-C. ...	45	4	650	S
Breguet (Stenbury) ...	F	40	518	1,120	Gobron ...	75	8	1,000	S
Monoplanes.									
Weiss (H. Page) ...	B	34	150	360	Anzani ...	12	3	500	½
Rep (Bessler-W.) ...	F	32	155	792	Rep	30	7	1,400	3
Special Types.									
Lamplough	B	56	920	1,200	Green ...	50	4	1,000	S
De la Hault (Miesse)	Be	—	—	1,680	Miesse ...	130	8	1,200	—

Remarks.

Country of Origin.—B = British; F = French. Be = Belgian.
Guarantee.—S = Flight to satisfaction of purchaser. * 25 mins.
Short.—Weight is for skeleton as exhibited. Special arrangements with purchaser *re* guarantee and price.
Moore-Brabazon.—Private exhibit of "The Bird of Passage."
Weiss.—Guarantee of straight flight only.
Rep.—Guarantee of circular flight at Buc, France.
Lamplough.—Biplane with oscillating lifters.
De la Hault.—Wings beat 80 per min. and give lifting effect without propulsion.

"The Bird of Passage" (J. T. C. MOORE-BRABAZON).

Such is the name which Mr. J. T. C. Moore-Brabazon has given to his No. 4 flyer which, like its predecessors, was constructed by Voisin Freres in France. It is the actual machine with which Mr. Moore-Brabazon made his latest famous flights at Issy, and it is the only flyer in the Show that has actually flown; incidentally, the mud on the wheels and chassis give the fact an air of practical reality. This particular flyer which is, of course, typical of the Voisin construction and to which our remarks about the Voisin machine exhibited by Mr. F. R. Simms therefore apply, happens to have been the first of the new pattern in which the distance between the main decks was increased from 1·5 metres to 2 metres. "The Bird of Passage" is equipped with an E.N.V. 8-cylinder engine which drives a twin-bladed propeller direct. The pilot sits in front of the engine in a rectangular car which projects forward to carry the elevator. Directly in front of him is a steering wheel like that on a motor car, but set on a horizontal spindle; this wheel the pilot turns to steer and pushes bodily to and fro in order to ascend and descend.

Voisin (F. R. SIMMS).

The biplane exhibited by Mr. F. R. Simms, who has secured the sole concession for these machines in this country, is one of the standard Voisin machines and affords an excellent example of the Voisin system of construction. Next to the Wrights', the Voisin flyers have been the most successful which have yet taken their place in the air. The great feature of the Voisin system is, as our readers know, the use of a box-kite tail, carried by an outrigger framework some distance behind the main plane. This tail, which encloses the rudder, is itself employed for the purpose of giving automatic longitudinal stability, the idea being that the wind blowing on to the tail uses the leverage afforded by the outrigger framework to bring the machine once more on to an even keel. In front of the main planes is an elevator, and between the main planes there are fixed four vertical side curtains; the car which carries the engine and the pilot is also covered with fabric.

The Voisin machine is certainly a well-built job, and it has a number of constructional details of considerable interest, some of which may or may not, of course, stand the test of time. The main planes are single surfaced, and the decks are thus very thin and flexible, which causes the spars and ribs to stand out rather prominently; each member is, however, encased in its own special bag.

It is a feature of the Voisin design, possibly resulting from certain details of construction, that each main plane has an overhung flexible rear edge which can adjust itself to the air streams. The elevator in front, on the contrary, is rigid fore and aft, and has top and bottom surfaces, which are nearly two inches apart at the thickest point. All the struts of the Voisin machine are elliptical in section, and have sharp cutting and trailing edges; they are neatly and rigidly mounted in aluminium sockets, which are bolted to the main spars. All the tension wires are adjustable. The machine is mounted on a two-wheeled chassis in front, and has a pair of small wheels under the tail; the suspension of the former is effected by long helical springs.

Delagrange (MASS CARS).

The Delagrange biplane as exhibited by the Mass Co. is a slightly modified Voisin machine; the modification consisting in the abolition of the four vertical side curtains which the Voisin machines proper employ between the two outer pairs of struts separating the main planes. In the machine shown, too, the distance

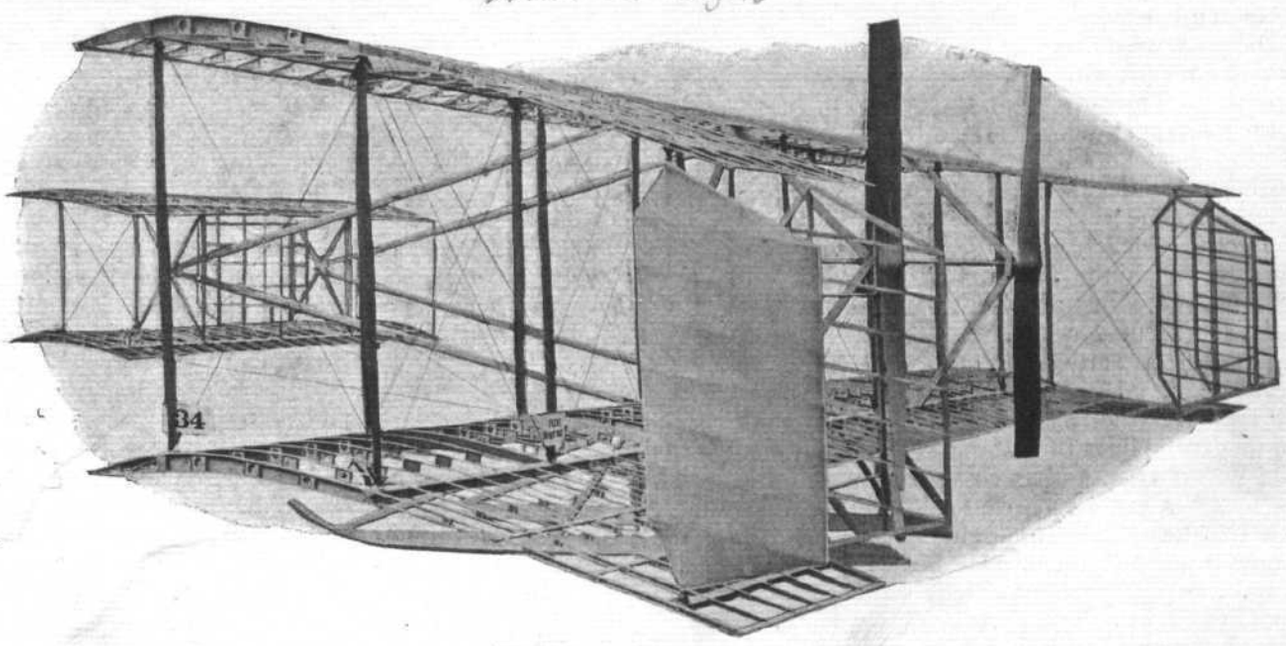
between the main planes is 0·5 metre less than that on the modern Voisin machines. The control is unaltered and the details of construction are likewise unchanged; the engine with which the flyer is equipped is a 50-h.p. 8-cyl. Antoinette.

M. Delagrange has, as readers of FLIGHT know, met with a considerable measure of success with these machines. He was one of the early winners of the Aero Club of France 200 metres prize, and for a brief period before Wright's achievements in that country, actually held the world's record with a flight lasting nearly 30 minutes, during the course of which he accomplished a distance of 24·7 kiloms., by making 15½ circuits of the Issy Parade Ground. Among other places, he has flown in Rome, and among other notable facts in connection with his performances is that he took aloft the first lady passenger, Madame Therese Peltier.

Short (SHORT BROS.).

The biplane Messrs. Short Bros. are showing at Olympia is one they have designed and constructed to their own ideas, and must not be confused with the Wright machines, which they are also building, but are unable to show. It is not like the Wright machine, except so far as it belongs to the same "tail-less" category, but this is an important similarity in view of the popularity of the Voisin "tailed" flyer among other constructors. Not only has the Short machine no tail, but it has no outstanding rudder as there is on the Wright flyer, steering on the Short model being effected by means of four interconnected rudders arranged in pairs just behind the extremities of the main planes. Where the rudders are situated the main planes themselves have greater fore and aft dimensions, and the flexible lips thus formed are flexed in opposite directions to control the lateral stability. Propulsion is effected by a pair of large diameter twin-bladed wooden propellers, situated immediately behind the rear edges of the main planes. The machine is mounted on a pair or skis, and arrangements have been made to use a loose-wheeled chassis for trial purposes if necessary.

The machine exhibited at Olympia is unfinished, but it is so far forward that it is difficult to believe that there has been but a fortnight's labour spent on it. To those really interested in flying machines its present state is possibly far more interesting than its final condition would have been, in fact, it may be said to bear the same relationship to the fledged flyer as a chassis does to a complete motor car, for it gives an unimpeded view of its constructional details. The machine is built entirely of wood and the workmanship throughout is excellent; moreover, much ability has been shown in the design of details, and it is evident that those responsible are fully appreciative of the importance of accuracy in experimental work. The structure as a whole is characterised by considerable flexibility, the object being to allow the machine to accommodate itself to the inequalities of the ground when landing. On the other hand the planes are rigid fore and aft to ensure an accurate curvature under all pressures. The main transverse spars dismantle into three sections for transports the joints being effected by simple fish-plate fastening, which are relieved of the bending strain by the usual system of diagonal wires and vertical wood struts. These latter are of plain oval section and are hinged at their extremities to aluminium lugs on the main spars by the use of flush steel flitch-plates. The planes themselves when finished will be double surfaced, and the construction of the fore and aft ribs to which the Continental fabric will be attached is one of the most interesting details in the construction. The same principle of double surface construction has been adopted for the rudders. There is a small vertical plane forming a prow or "cut-water" between the two decks of the biplane elevator. Like the rest of the machines the propellers are constructed of wood and have also been made at the Short factory. Each propeller is built up from a composite block of wood made of six layers.



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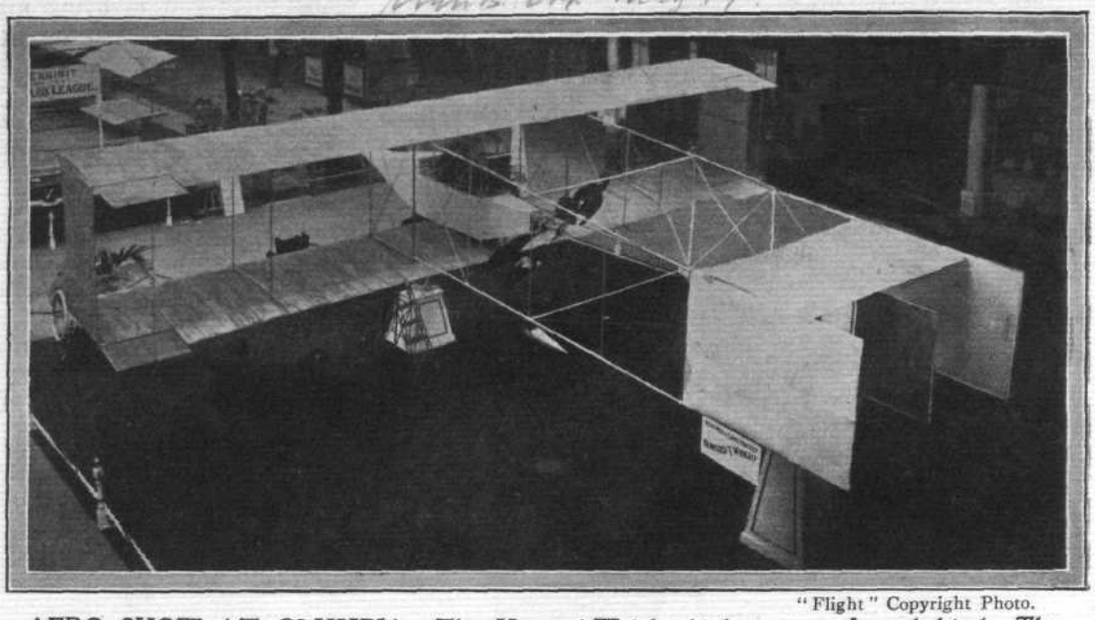
AERO SHOW AT OLYMPIA.—The Short flyer seen from one side, showing the skeleton framework. One of the four rudders has alone been covered with Continental fabric, the remainder of the machine being quite unfinished. The flexing of the righting tips is well shown on the extreme right, and in front, on the left of the photograph, the biplane elevator can be seen.

Howard-Wright (HOWARD T. WRIGHT).

The biplane designed by Mr. Howard T. Wright and built at his factory has several original features, of which perhaps the most important is the entire use of steel tubes in the construction of the framework. These tubes are of special steel, and are specially drawn to different sections, those forming the main longitudinal members being tubular, while those which form the struts between the two decks have a pear-shaped section in accordance with the accepted theories of air-resistance. Other tubes again are oval in section, so that in the whole construction no trouble and expense has been spared to combine strength with lightness. Throughout, the joints are rigid, and in most cases have been formed by the oxy-acetylene welding process, which has even been used for securing the staples to which the tie-wires are attached. In other places flanged joints are used, but everywhere the work has been executed with the same care, so that the machine has a particularly neat, not to say delicate appearance, the latter effect being given to it by the small section of the steel tubing of the main framework.



"Flight" Copyright Photo.

AERO SHOW AT OLYMPIA.—The Howard-Wright biplane, seen from behind. The entire framework is made of steel, and another special feature is the use of tandem propellers revolving in opposite directions. The righting tips let into the rear edges of the main planes are clearly indicated in this view.

In its general lines the Howard-Wright biplane belongs to the Voisin type, inasmuch as it has a box-kite tail. This member encloses a vertical rudder, and there is also a biplane elevator in front. The mounting of the machine is unusual, for there is but one wheel for it to run on beneath the central chassis and another under the tail. On the extremities of the lower deck there are, however, two small wheels of the bicycle type. The idea involved is that the embryo aviator will be able to learn something of the control of the machine without leaving *terra firma* by driving it about over the ground on two wheels only; in this way it is anticipated that he will learn to steer and balance the machine. Inset into the rear edges of the main planes at both ends and on both decks are small righting planes, which are used for restoring lateral stability.

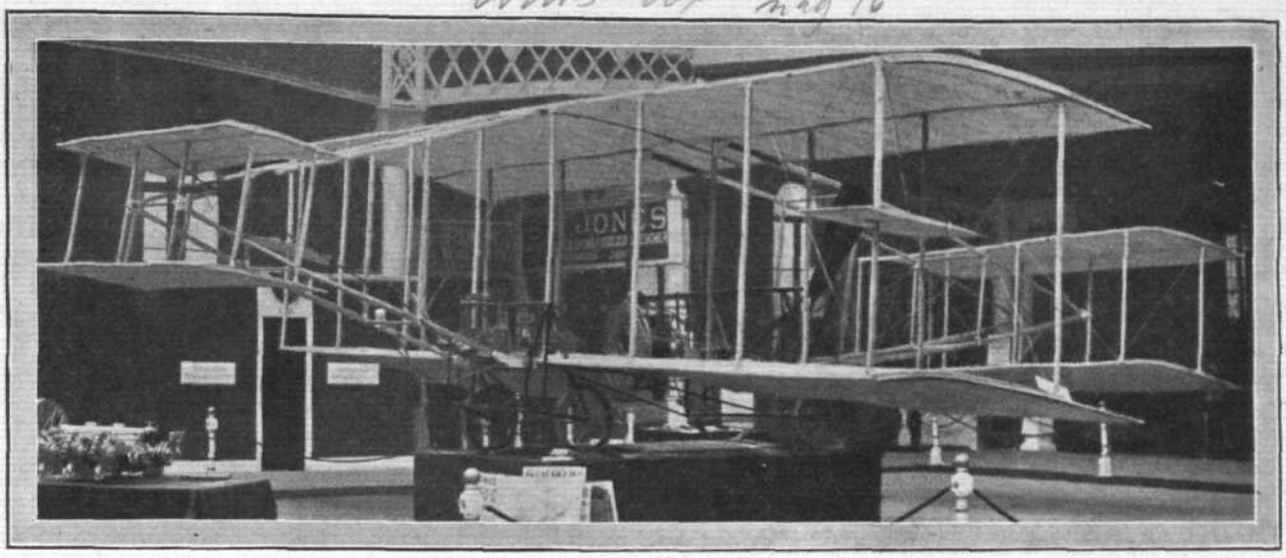
The motive power is derived from a 50-h.p. Metallurgique aero-motor, and a special feature of the system of propulsion is the use of a pair of compensated two-bladed propellers mounted in tandem. At first sight it appears as if there is but one four-bladed propeller in position, but, as a matter of fact, each pair of blades are separate, and revolve in opposite directions. They are interconnected by means of a differential-gear—similar to that used on a motor car—one member of which is driven direct by the engine. The propeller nearest the motor has much larger blades than that behind it, and absorbs two-thirds of the power, but the speeds of the propellers are equal: each runs at one-third the engine speed. Mr. Howard Wright's object in arranging his propellers so that they revolve in opposite directions is to neutralise their gyroscopic effect; the torque of the engine is not balanced by this system, as might at first appear to be the case. The surfaces of the flyer are made of linen, coated with a specially smooth glossy varnish. The car or chassis of the machine is also entirely covered with fabric, and the pilot sits almost immediately over the front edge of the lower deck.

Pischoff (CAPT. WINDHAM).

Capt. Windham, who has entered the commercial side of aviation, shows a biplane, which was constructed for him by Messrs. Pischoff, in France, embodying ideas of his own. Capt. Windham has now arranged to build similar machines in England for sale to the public at the price of £650 complete. One of the most characteristic features of the machine is that derived from the appearance of the outrigger framework which carries the biplane elevator in front and the rigid biplane tail behind. The first impression is that this framework is one complete elliptical unit, but closer inspection shows the lack of continuity in the upper girder members which stop short under the main planes. The machine is mainly constructed of wood, but has a certain amount of tubular steel work in connection with the chassis and the brackets for the support of the two chain-driven propellers which are situated immediately behind the main planes, and therefore a little aft of the centre of the machine as a whole. The planes themselves are double surfaced, but the appearance of the end webs does not give evidence of any close attention to special curvature. The decks are separated by vertical wood struts, with the usual system of diagonal wiring. The struts are bolted to strip iron angle plates, which in turn are either bolted or screwed to the main spars, but although this detail in the construction is evidently not intended to be flexible, the rough fitting certainly belies rigidity; in fact, there is a distinct lack of refined workmanship in many parts of the machine.

An original feature of the control is pivoting the back of the pilot's seat so that by swaying his body he can

Evans box neg 16



"Flight" Copyright Photo.

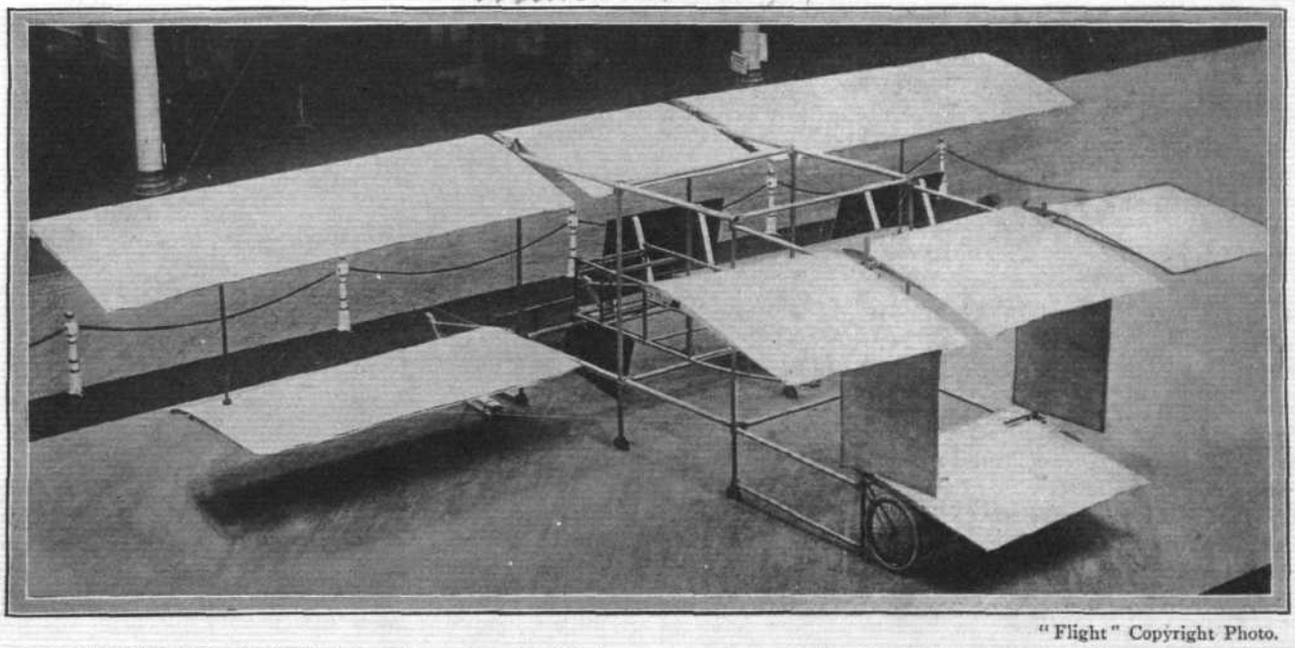
AERO SHOW AT OLYMPIA.—Captain Windham's Pischoff flyer seen from in front. One of the righting planes, which are mounted midway up the outside stays, is clearly visible. The rudder, which should be between the planes of the rear tail, is not shown.

operate the movements of a pair of small righting planes which are pivoted midway between the main planes at each extremity. The elevator and rudder, the latter being in the middle of the tail, are controlled by a single lever operated by the driver's right hand. The engine with which the machine is at present equipped is a 2-cyl. Dutheil-Chalmers, but the machines which Captain Windham will construct in this country will have 4-cyl. engines of the same make.

Breguet (J. STENBURY).

The Breguet biplane, exhibited by the concessionaire, Mr. J. Stenbury, is a very different machine to the combined helicopter-biplane which the same designer exhibited in Paris, but it nevertheless embodies equally uncommon ideas. As a system it is peculiar, not to say unique, amongst biplanes, in having absolutely no sort of supplementary surface in front of the main planes, which are themselves so mounted that they can tilt for elevating and righting purposes. The details of the control levers and wires are not fitted, and, indeed, the machine is far from complete. A comparatively short distance behind the main planes are a set of large tail planes, these being arranged in biplane form, but with the upper deck three times the spread of the lower deck. Between the two decks are a pair of vertical rudders. The whole structure has a most massive appearance, owing to the fact that it is built up entirely of steel tubes, some of which are no less than $2\frac{1}{2}$ ins. in diameter. The tubular spars, which support the main surfaces, are jointed to the main framework, so that the planes can be folded back out of the way for transport; when extended the joint is locked solid by using the spar itself as an internal bolt. In consequence of the large diameter of these tubular spars which pass through between the double surfaces of the planes, the planes themselves are of unusual thickness.

Evans box neg 4



"Flight" Copyright Photo.

AERO SHOW AT OLYMPIA.—The Breguet Biplane, seen from behind. Tubular steel of large diameter is used throughout in its construction, and knuckle-joints are introduced to enable the planes to fold back out of the way. The forward planes are pivoted for elevating. The machine is unfinished.

A feature of the Breguet construction which is well worthy of attention is the method of obtaining a smooth round cutting edge by the use of thin sheet aluminium tacked on over the Continental fabric. Aluminium ribs of shallow channel section are also used for stiffening the decks, and the same metal is employed in the construction of the flexible propeller blades, which are, however, not shown at Olympia. For the support of the main planes only four tubular steel struts are used, one pair at the extremities, and the other pair in the middle, where they form part of the central framework. The engine with which the machine will be equipped is a 75-h.p. Gobron aero-motor; it will drive a tractor screw in front, which is another peculiarity of the Breguet biplane, since most machines of this type have propellers behind the main planes.

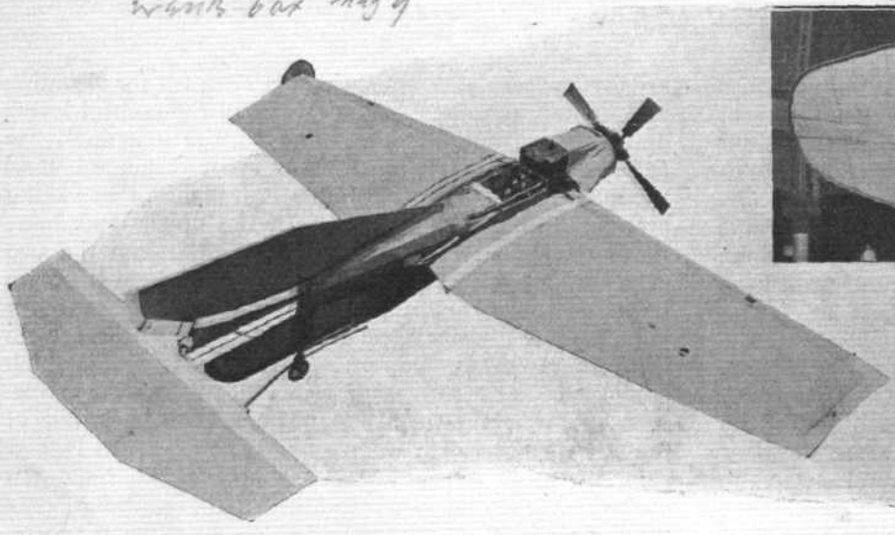
Rep (BESSLER-WAECHTER).

The Rep monoplane exhibited by Messrs. Bessler-Waechter, who are the British manufacturers for M. Esnault-Pelterie, is in the main a copy of that No. 2 bis. which was exhibited at Paris and with which M. Pelterie has himself made his most successful experiments. Except in slight details which would pass unnoticed by those not closely acquainted with the precise lines of the earlier model, the flyer on view at Olympia is quite unaltered, but close inspection shows that the tail end of the body of the machine has been slightly modified in its lines and now is more rounded in its section than formerly. The rudder, too, is a little smaller, but the system of control remains unchanged. Ascending and descending is accomplished mainly by the use of the stern elevator, steering is managed by means of the rear rudder, and lateral stability is obtained by warping the main wings. These operations are performed by levers, one of which besides warping the wings also flexes the elevator within certain limits; this particular lever is universally jointed to move either sideways or to and fro. There are two other levers which can be used to set the rudder and to set the elevator in any given position. When ascending it is the rear edge of the stern elevator which is tilted; in biplanes which have an elevator in front of the machine it is of course the front edge which is tilted for this purpose. When proceeding at any given speed, an increase of speed of the engine also causes ascent with any given setting of the elevator.

A feature of the general scheme of the R.E.P. flyer is the mounting of the machine on two wheels, with guide wheels on the tips of the main wings, so that the pilot can learn to partially control his machine without leaving the ground. Why M. Esnault-Pelterie adopted the monoplane principle he explained in a lecture before the members of the Aero Club some weeks ago. It was, as our readers will remember, mainly because he found that the wires necessary in the construction of a biplane offered tremendous resistance, far greater in fact than would be imagined from their small diameter.

De la Hault (MIESSE).

The flapping wing flyer for which Messrs. Miesse have the British concession is a machine of very peculiar construction. The wings consist of a pair of fabric-covered blades which are mounted on trunnions and are articulated through ball and socket connections by a pair of spur wheels which in turn are operated by a system of gearing from an engine which is placed on a lower level and with its crank-shaft vertical. The relative position of the ball socket joint to the trunnion which carries the paddle is such that the rotation of the gear wheel causes the paddles to perform downward beat followed by a feathering motion, but although this has the appearance of a rowing stroke there is no propulsive effort, for such forward drive as there might be is neutralised by a retarding period immediately preceding the downward beat. We are informed that this machine has actually lifted itself in the air for a period which was only brought to a conclusion because the gear wheels gave way.



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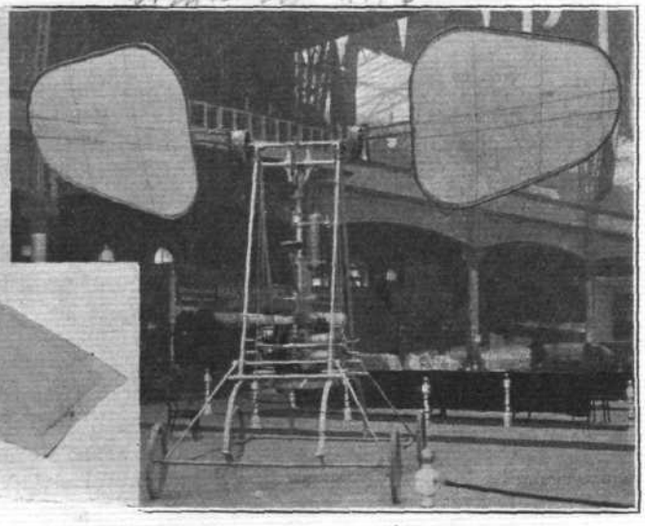
AERO SHOW AT OLYMPIA.—The Rep Monoplane, seen from above, and showing the lacing of the wing surfaces to the main frame; the lacing is subsequently covered with fabric. The elevator, tail, rudder and rigid keel are very distinctly shown.



"Flight" Copyright Photo

The De la Hault orthopter, which is designed to rise in the air by beating its wings. The wing stroke, although apparently of a rowing nature, gives no propulsive effort. The engine is an 8-cylinder Miesse.

Weiss (HANDLEY PAGE).

Readers of the "Flight" section of *The Automotor Journal* will recollect our description of the bird-like model monoplanes constructed by Mr. Weiss. The machine which Messrs. Handley Page exhibit at Olympia is a full-size flyer on the same lines, and has also been built by the inventor himself. Like most work which has been put together in this way, the flyer is naturally somewhat rough-and-ready in appearance, for practically

the whole of the framework is built up of cane, and this is a material which does not lend itself very well to neat jointing.

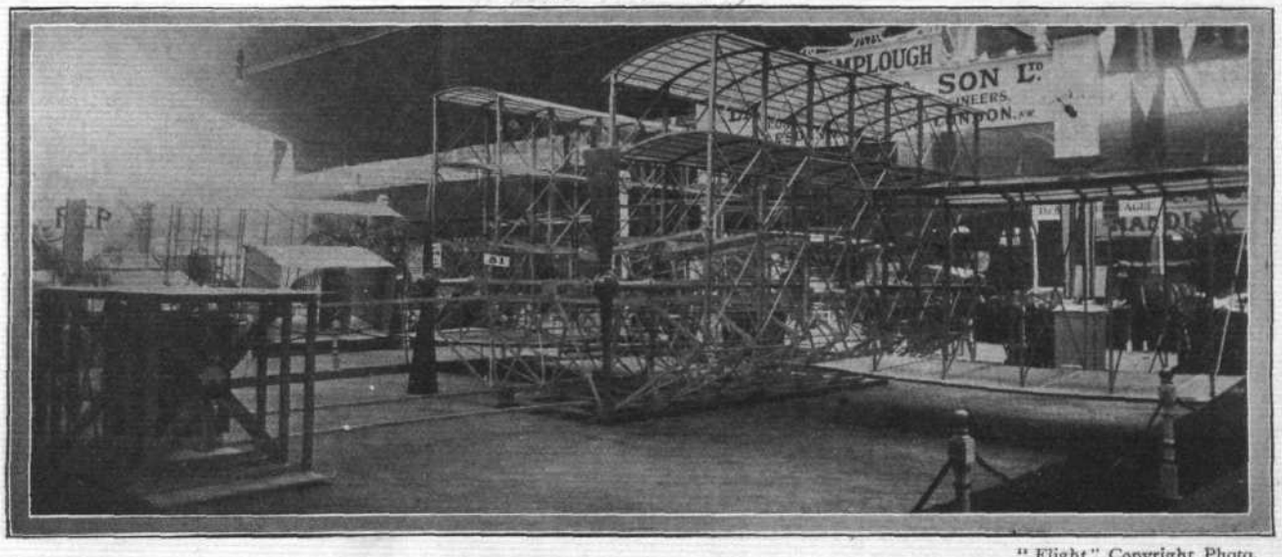
The Weiss flyer is of the monoplane type, and is peculiar amongst such machines in having no tail whatever. Let into the rear edges of the main wings, however, are a pair of righting planes operated by pedals so that they can work in unison for ascending and descending, and in opposite directions for steering and

"Flight" Copyright Photo.

AERO SHOW.—The Weiss Monoplane, seen from in front. This is a full-sized model built by the inventor himself, and is mainly constructed of cane. The use of two propellers on a monoplane is an uncommon feature.

righting. Another peculiarity of the construction of the wings is their double curvature at the tips, it having been found from the gliding experiments with the models that everything depends upon having this curvature absolutely correct. Propulsion is effected by two propellers placed between the righting planes and the rear edges of the main planes. These propellers are chain-driven from an engine which is situated immediately behind the pilot. The machine, although comparatively small in appearance, has a considerable extent of supporting surface. As yet no actual man-lifting flight has been accomplished.

In order to appreciate its principle it is necessary to know what idea governed its design, and for that it is necessary to revert to Professor Pedigrew's theory of bird wing flight. Broadly speaking, that theory may be summed up by stating that the stroke of a bird's wing forms the figure eight, and Mr. Lamplough, accepting that view as suitable for a basis of mechanical flight, set himself the problem of reproducing it in an actual machine. The mechanical system he has devised consists in imparting a kind of swaying motion to two biplanes arranged longitudinally with their cutting edges facing one another. The planes are hinged, as also are the columns which support them, and as they sway to and fro a pair of cranks dip and tilt alternately, the adjacent edges, so that in a complete cycle an approximate figure of eight is performed. As the two biplanes approach one another the adjacent edges are tilted, and the planes being forced through the air create a lifting effect; when their motion is finished these edges are drawn downwards by the cranks, and as the biplanes recede it is their outer



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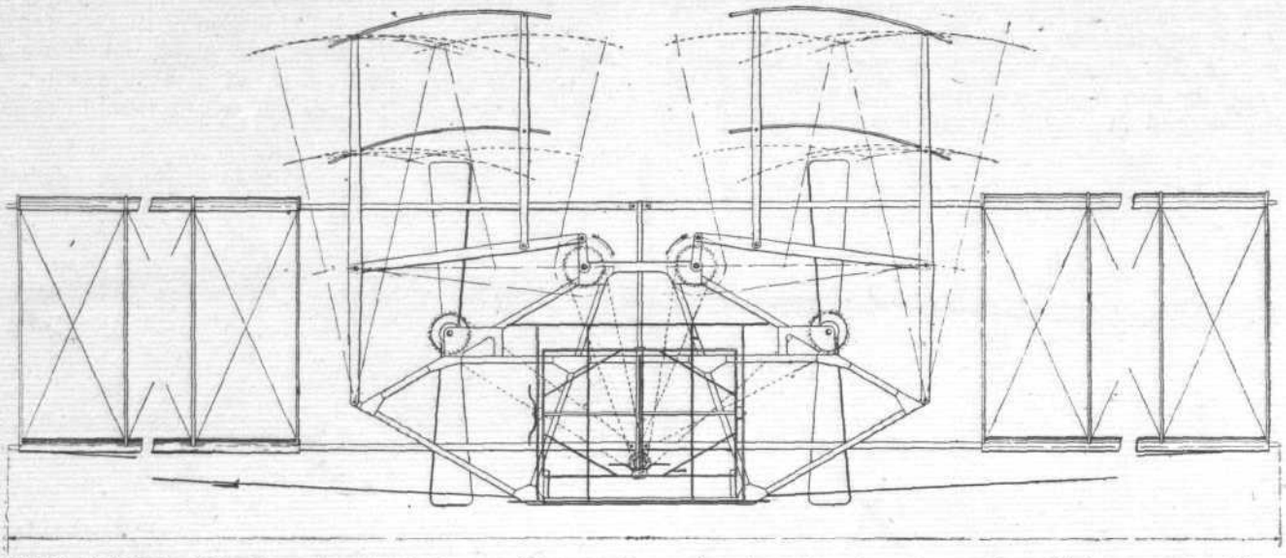
AERO SHOW.—The Lamplough Orthopter Biplane, seen from behind. The central planes, which run longitudinally, sway to and fro with a lifting effect, while the lateral biplanes on either side are rigid in the usual way. At the extreme rear is a biplane elevator containing a rudder, and in front there is a precisely similar structure. The machine is unfinished.

Lamplough (LAMPLOUGH AND SON).

The flying machine which has been designed by Mr. Lamplough and constructed by his firm at Willesden is of an altogether unusual description, and quite unlike anything which has probably ever been built elsewhere. edges which are in turn relatively elevated so that once more a lifting effect is produced. The outer edges do not actually vary their position—it is only the inner edges which rise and fall—for it is along these edges that the planes are hinged to their supports. This part of the machine is a

lifting device pure and simple, and forms the central portion of the structure; extended on either side, however, are a pair of biplanes proper with their cutting edges arranged transversely in the usual way. In front and behind are biplane elevators enclosing single rudders, and propulsion is effected by a pair of wooden propellers.



AERO SHOW.—The Lamplough Orthopter Biplane, front elevation, showing the cranks which sway the lifters and the link motion which reverses their angle of inclination so that each stroke is effective. The dotted lines indicate the limiting positions of the lifters in each direction.

In the machine exhibited the whole construction is of wood, but when finished the vertical supports will be of tubular steel and the diagonal ties of steel wire. We understand that models which have been made have given remarkable results, lifting themselves by clockwork mechanism right up into the air, and a curious feature which has been found to be associated with this principle is that the lifting planes act as a parachute to steady the descent when the motive power stops. The lifting action of the lifting planes which has already been described may perhaps be better understood by considering it as analogous to the slight paddling motion which a swimmer makes with his hands whilst he floats on his back.

The Lighter Side of the Aero Show.

MEN AND METHODS AT OLYMPIA.

CONCERNING IMPRESSIONS RECEIVED, CHIEFLY OF A SORT THAT IT WAS NOT INTENDED TO HAVE CONVEYED.

By H. MASSAC BUIST.

A WEEK'S study of the first flying machine Show at Olympia has furnished me with some thoughts that call for utterance in the interests of a new science, a budding industry and a movement fraught with mighty possibilities in regard to the future of International armament. As the purpose will be best served by expressing my meaning in the plainest terms, I wish it to be clearly understood that I do not want FLIGHT to be held responsible in any way for the observations I am about to make. Furthermore, as my objective is to criticise systems, not individuals, there is no need for me to mention names or to indicate particular persons; while as a guarantee of my sincerity I put my name to these remarks, that none may say I am ashamed to own to them.

In the first place, taking the Show as a whole, I perceive that young Mr. Mannerless was proportionately more in evidence than he is at motor shows. This class of gentleman receives wages on the understanding that he does his best first to interest the visitors in whatever exhibit he may be connected with, and secondly, to secure orders when possible. He is a curious creature who sets to work to achieve this aim by lolling about in a chair with a cigarette in his mouth and a newspaper in his hands. "Sir" is a word not to be found in his vocabulary. He could not pull his hands out of his pockets, far less stand up when spoken to. He thinks any display of manners is something to be heartily ashamed of, and smokes continually because his ideal of a gentleman is a human stove-pipe. When he wants to be thoroughly obliging in answer to any request to explain the features of his exhibit he does not say, "With pleasure," but "Right you are."

My advice to employers is, that as you have no right to be at an Exhibition if you are not there on business bent, so you should never leave your stand for five minutes together in charge of an unlicked cub of this type. If the noodles lack energy, at least follow the practice that is found to answer so well in the Army, "Be lazy and civil."

My second impression is associated with the fault of even a graver character. "I believe there are far more liars than flyers in this building," said a visitor to me on the second day. And when I recalled the preposterously irresponsible claims that I had heard made on behalf of sundry exhibits, I could not but admit that there was something in the impression; also it seems necessary to some minds to throw mud at somebody in order to make any value attach to the article in which you may be personally interested. Of course, I heard not once but many times that the Wright machine was really no good, but that everything that had been done with it was due to the extraordinary acrobatic talents of the American brothers. The fact that telegrams from abroad on the very day the Show had opened proved that of the first two pupils taken in hand by Wilbur Wright one had become proficient to make a solo trip after 5 hours and 10 minutes' tuition, and the other after 6½ hours' teaching, did not seem to embarass such critics in the least. Other boldly uttered criticisms are to the effect that whenever there is any wind Mr. Wright cannot fly and that he only goes up at 5 o'clock in the evening when calm prevails. The fact that he only goes up at 5 o'clock in the evening because he is no longer learning to fly himself and only makes trips when teaching pupils, who naturally require the most variable conditions possible, is a fact as glibly ignored as are the many occasions on which he has gone up in pretty stiff breezes when demonstrating the machine himself. It is not the least unfortunate phase of an incipient industry that in many quarters it seems impossible to have any faith in advancing the claims for one's own products without making disparaging reference to those of other folk. That is a very foolish business policy, because anybody connected with any industry ought to make himself sufficiently familiar with the ins and outs of it to be quite well aware of the futility of pursuing the policy of the grapes are sour. In the case of the flying business, it is assured already that Wright machines will be performing in this country within the next five months, so that, looked at as a mere business proposition, any unjustifiable statements about the capabilities of the American-designed machines can only recoil on the heads of those who utter them, because all business worth establishing has its basis in good repute. If you cause people to lose faith in you, you can try to get their orders in vain. Therefore, never utter a thought that you are not absolutely sure is founded on fact. And do not pander to that school of the Press that knows no better way of dealing with a flying machine show than to announce how many machines are supposed to have been sold in so many hours.

My advice to all who wish to sell aerial conveyances is: "Make up your minds to be flyers, not liars."

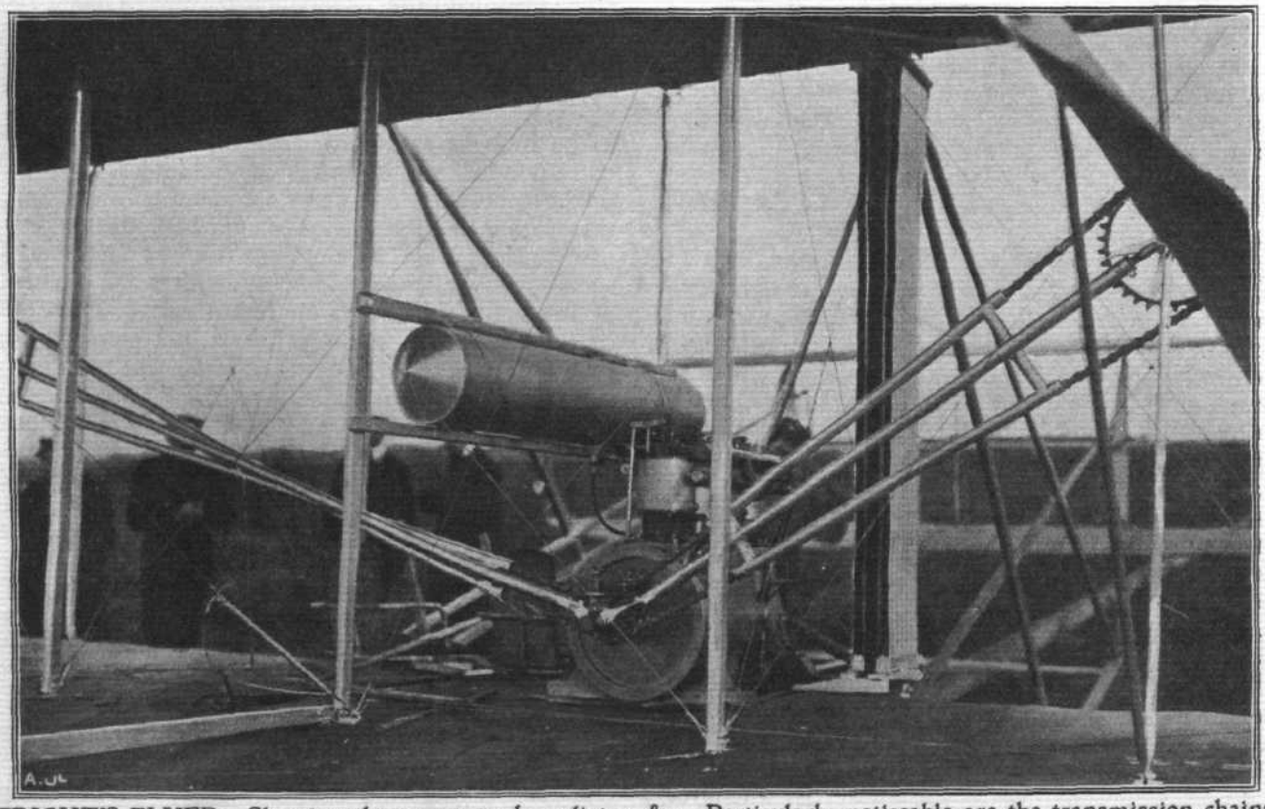
I turn now to the class of man who is not so much concerned with the commercial phases of flight as with its purely scientific and engineering aspects. A trade body, the Society of Motor Manufacturers and Traders, has guaranteed expenses to the tune of £5,000, for the sole purpose of enabling inventors and the British public to be brought together. Yet among the unnecessary correspondence that makes my table less tidy than it ought to be, there are many eloquent epistles suggesting that during the past week I should be better employed at many places than wasting my time at Olympia. One such correspondent puts his case with a conciseness that at first sight he conveys the impression of quite brilliant business ability. He says he is not showing for the following reasons: "(1) It is so important to lose as little time as possible; (2) Expense; (3) I do not care to show publicly until my ability is proved." Let me befriend this inventor by showing him at least how to to economise his expenditure to at least the extent of a penny stamp for the following reasons: (1) I have seen him spending hours in casual conversation at Olympia; (2) It is true the Society of Motor Manufacturers and Traders is deserving of severe censure for not having offered a pension of at least 5*s*. a week for life to everybody who would condescend to let their machines be displayed; at the same time before passing final judgment on them one might recall that paltry sum of £5,000 which they have guaranteed that inventors might be able to exhibit without any charge whatever; and (3) if bashfulness concerning publicity is entertained, why seek it through me, and above all why commit to paper the words that "my system . . . is a great improvement on both Wrights' old and new ideas?" These correspondents represent a type of

humanity that is prone to complain that the world is out of joint. Might I ask them to devote ten minutes of their valuable time to endeavouring to put themselves into the position of the mere commonplace men and women to whom they unfold their ideas from time to time, chiefly with the aim of endeavouring to procure capital wherewith to proceed on their line of investigation. Now men make money chiefly by the possession of that quality which men call a practical mind. Those who, possessing means, do not have practical minds, usually get severed from their money sooner or later. Now a practical man is apt to set more store by the evidence of his eyes and other guess proofs than by any mere statement of claims. Therefore what chance has a claimant of impressing such a man favourably when he starts proceedings by telling him that he has evolved not a machine that works thus and thus, and that the results should be this and that, but that he has designed "the most promising aeroplane so far produced, and out and away better than Wright's." Why not give Wright a rest? The more you talk against him the more you advertise his excellence for the very good reason that he is a miser in the use of words, a man who rarely makes a claim, a performer who always demonstrates every point with a full scale machine before he advances a single claim, and one who will not criticise the products of his rivals. Is not his world-wide success sufficient to satisfy your own ambitions? If it is, imitate his conduct. And remember that if you have evolved a machine of original design with which flights can be made, you have something for which the world has a use; and the practical men with whom you want to get in touch will not in the least care whether it is better than Voisin's, Pelterie's, Wrights', or Bleriot's, because they have sufficient common sense to know that, whatever stage your invention has arrived at, it is a mere starting point, and that the logical inevitable processes of commercial development will bring it to a degree of practical perfection if the idea behind it is a right one.

My advice to men with ideas to market is: "Be practical, not cussed; because you may rest assured that if anything is out of joint it is yourself, not the world. Try and see yourselves as others see you and you will stand a much better chance of getting on."

These remarks have been conceived in a spirit of helpfulness. I plead for what should become one of the grandest industries, if not the grandest the world has ever known. The Press will, doubtless, prove a great medium for fostering the growth of the movement, but I have grave misgivings that in very many cases a large section of the daily prints will unwittingly prove more enemies than friends to aerial locomotion, because whenever a success is achieved there is a regrettable tendency to exaggerate it, possibly with the laudable aim of drawing attention to it. But the thing has its reverse side, for when a mishap occurs, as occur they must, because man can only learn through repeated experiment, it is announced by bold type and sensational phrase. I do not believe the types of persons I have been discussing have the least notion of the impressions they create. That is why I am trying to befriend them by showing them to themselves as another sees them.

In conclusion, I do not mean that everybody encountered at the Show in connection with various phases of the movement displayed the faults of character I have striven to correct. On the contrary, the types of which I complain were, fortunately, in a minority. Be that as it may, however, the classes were in evidence; and it were well for the health of the movement that they should modify their methods until they resemble those of rational business folk.



WRIGHT'S FLYER.—Showing the motor, tank, radiator, &c. Particularly noticeable are the transmission chains, running through the tubing, to the propellers, that on the left being crossed in order that the propellers may revolve in opposite directions to neutralise their disturbing influence on the balance of the machine.

AERO CLUB OF THE UNITED KINGDOM.

OFFICIAL NOTICES TO MEMBERS.

A meeting of the Committee was held on Tuesday, 23rd inst., at 166, Piccadilly, W., when there were present: Mr. Roger W. Wallace, K.C., in the chair, Mr. Griffith Brewer, Mr. Martin Dale, Mr. J. T. C. Moore-Brabazon, Mr. C. F. Pollock, Hon. C. S. Rolls, H. E. Perrin (Secretary).

New Members.

The following new Members were elected:—

Marshall Bruce-Williams.
M. V. Charrington.
Colin Defries.
Alan R. Fenn.
Lt. Reginald Gregory.
Graham Hurd-Wood.
Prince Michael Swiatopolk-Mirski.
J. L. Travers, Junr.
Vincent Vickers.
Oswald H. Wells.

Prize Treatise on Aerial Navigation.

The Aero Club have received the following letter from the Commercial Intelligence Branch, Board of Trade:—

SIR,—I beg to state for your information that His Majesty's Consul-General at Antwerp writes to the following effect:—

"The *Moniteur Belge*, of the 25th–26th January, contains a Royal Decree, at the instance of the Minister of Science and Arts, to the effect that the prize to be awarded in 1911 for the open competition will be given to the best composition replying to the following question:—'Describe the progress of aerial navigation and the best means of encouraging it.' Papers destined for this competition should be transmitted to the Minister of Science and Arts before the 1st of March, 1911."

I may further state that according to the above-mentioned Decree, the prizes offered amounts to 25,000 francs (£1,000).

I am, Sir,
Your obedient servant,
F. BARLEY.

English Michelin Cup.

Michelin Tyre Co. have offered, through the Aero Club of the United Kingdom, a Trophy of the total value of £500, which will carry with it annually a sum of £500 for a term of five years, to be competed for by British subjects manipulating a British-made flying machine. The rules are now being drawn up by the Committee of the Aero Club, and will be published shortly.

HAROLD E. PERRIN, Secretary.
The Aero Club of the United Kingdom,
166, Piccadilly, W.

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AERO SHOW—THE INAUGURAL LUNCHEON.

IN accordance with its usual custom, the Society of Motor Manufacturers and Traders inaugurated the exhibition at Olympia with a luncheon held in the Pillar Hall. The Chairman, Mr. E. Manville, President of the Society, was supported by H.S.H. Prince Francis of Teck, The Marquess of Ailsa, Mr. Roger W. Wallace, K.C., Chairman of the Aero Club, and Admiral Sir Wm. Kennedy, K.C.B., Admiral of the British Motor Boat Club. Among those present who are more prominently known in the world of flight were Colonel Capper, C.B., Mr. J. T. C. Moore-Brabazon, and Sir Hiram Maxim.

After the loyal toasts had been duly honoured, Prince Francis of Teck proposed the toast of the Exhibition, and in a telling speech reviewed the present, past and future of the movements associated with the development of the internal combustion engine. "If motors were the competitors of horses, what were aeroplanes?" asked His Highness, and followed with a suggestion that so far as he was personally concerned he would willingly see them rival the cross-Channel boats and all other vessels on which passengers were subject to the turbulent and discomposing effects of the sea. Perhaps, also, suggested the Prince, there would come a time when the golfer at St. Andrews would mount his aeroplane and journey south to links devoid of snow, for in that and in many other sports the practical flyer would be an advantageous auxiliary. In concluding his speech, he wished success to the Wellman North Polar expedition.

Mr. E. Manville replied on behalf of the S.M.M.T., and hoped that private enterprise would do as much for this pastime as it had done for all others; to which Mr. Roger Wallace, K.C., who replied on behalf of the Aero Club, added the further warning against the indiscriminate solicitation of public capital in a manner likely to be ultimately harmful to the budding industry.

In replying to the toast of "The Guests," Colonel Capper pointed out the necessity of fostering the movement in this country, and asked for a more sympathetic regard for experimental work on the part of the public and the daily Press as a means to this end. Admiral Sir William Kennedy, who also replied to this toast, naturally confined himself to the marine section, and made a characteristically stirring speech, in the course of which he indulged in a little plain talking on what he described as the unseemly squabble over the "Dreadnought" question. Mr. E. P. Frost, J.P., also replied in the capacity of Chairman of the Aeronautical Society of Great Britain, which, as he pointed out, is the oldest institution in the world associated with aerial navigation.

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News of the Week.

KING EDWARD AND THE WRIGHT BROTHERS.—As was anticipated, King Edward last week motored over to Pau from Biarritz, and witnessed some remarkable exhibitions of flight by Wilbur Wright, His Majesty taking the keenest interest in the unique machine and the details of manipulation. His Majesty is seen above walking with Brothers Wilbur and Orville to the aeroplane house prior to the flights.

A British "Michelin Cup."

Up to the present time there have not been many prizes offered in Great Britain for aviation, and it is, therefore, with great pleasure that we draw our readers' attention to the munificent offer to British aviators made by the Michelin Tyre Co., full details of which appear on p. 187.

Our Army Flyer.

On Tuesday last some experiments were made by Mr. F. S. Cody with the Army aeroplane, but in view of the wet condition of Laffan's Plain the tests were made on Farnborough Common, and in consequence only very short flights were attempted.

A Meeting at the Mansion House.

Under the Presidency of the Lord Mayor and the auspices of the Aerial League, a meeting is to be held at the Mansion House on April 5th, with the object of calling the attention of the citizens of London to the backward position of the British Empire in matters aeronautical.

An Aviation Poster Wanted.

Those responsible for the organisation of the Rheims aviation meeting from August 22nd to 29th, are seeking an attractive design for a suitable advertisement poster, and offer prizes of 500, 300 and 200 francs respectively for the three best designs selected. Designs to the Committee, at 8, Rue Bertin, Rheims, by April 8th.

The Ladies A.C. and Flight.

On Wednesday Dr. H. S. Hele-Shaw delivered a lecture before the Ladies A.C. on "The Progress of Aviation," dealing in a popular way with the history of aeronautics from the invention of the Montgolfier balloon to the present day. The development of the spherical balloon to the dirigible airship of the present day was traced, and also the fair audience learnt how aeroplanes of to-day had grown from the gliding experiments of Lilienthal, Pilcher, Langley, Chanute and others. By way of illustrating the effect of warping the wings and adjusting the tail, Dr. Hele-Shaw made some experiments with paper birds, similar to those which have been distributed at Olympia by Flight. An excellent series of cinematograph pictures of the "Zeppelin" and "Republique" airships, and the Wright and Farman aeroplanes in flight, together with a number of excellent lantern slides of other flying machines, illustrated the lecture.

The Wright Pupils Fly by Themselves.

To the many who so loudly proclaim that the Wright flyer is of little account in the problem of aerial navigation, the announcement that both Count Lambert and M. Paul Tissandier have been flying by themselves, individually and respectively, on the Wright machine must have come as a shock this week. Nevertheless

The emblematical car at the Paris Mi-Carême Fêtes last week, in which "La Reine des Reines" rode during the procession. This car, always up to date, is, it will be noticed, in its main features, a clever combination of an aeroplane and a motor car.

such is the fact, and it is the more important from the fact that the first named had in all but 5¼ hours' teaching, and the latter 6½ hours. On Friday of last week Count Lambert flew by himself for periods of 3, 6, and 23 minutes each, and immediately after M. Tissandier made a solo flight of 24 minutes. During both essays the pupils were quite at home with the machine, making graceful turns and curves, only a little less graceful, by comparison, with their master. And so the subjugation of air is still a step nearer completion.

Count Lambert to Manage Pau School.

Now that Wilbur Wright has left Pau to join his brother Orville and sister Katherine in Paris, prior to their departure for Italy, Count Lambert will remain in charge of the school of aviation established at Pau.

The "Silver Dart" Wins the "Scientific American" Trophy.

ON Thursday of last week, Mr. McCurdy made a successful attempt with the "Silver Dart" to win the *Scientific American* Trophy, which was first won by the "June Bug" last year. An 8 mile course was laid out, and Mr. McCurdy succeeded in circling round this course twice, the flight being witnessed by a member of the American Aero Club. At twilight on the same day, Mr. Baldwin, another member of the American Experimental Association, took Mr. McCurdy's place, and made a successful flight, thus demonstrating that the machine can be handled by more than one person. It may be remembered that in the early flights Mr. Curtiss was in charge.

THE WINNER OF THE "SCIENTIFIC AMERICAN" TROPHY.—In the above photo the successful American aeroplane, "Silver Dart," is seen just preparing for a flight. Last week, by circling twice over an 8-mile course in this machine, Mr. McCurdy secured the "Scientific American" Trophy.

Monaco Entries total 36.

ALTHOUGH the final entry total was last week given as 35 for the Monaco flight contest, this must now be increased by one to 36, as M. Henry de Puybaudet, by telegram at the last moment, entered in correct form a Voisin biplane. The strike of telegraphists, however, upset the course of events, the wire not arriving at its destination until two days after. The date of despatch, however, it was held, governed the entry.

The Rheims Meeting.

FURTHER particulars are now to hand regarding the prizes which will be offered at the Rheims meeting in addition to the Gordon-Bennett Aviation Cup value 25,000 francs. The chief event will be the distance competition for the Grand Prix de Champagne, which will include a first prize of 50,000 francs, a second prize of 25,000 francs, a third of 10,000 francs, and three others of 5,000 francs. In the speed contest the first prize will be 10,000 francs, with a second prize of 5,000 francs, a third of 3,000 francs, and a fourth of 2,000 francs. There will also be the passenger, altitude, and circuit competitions, in each of which the value of the prizes will be 10,000 rancs. The foregoing prizes are all for motor-driven aeroplanes, but in addition there will be a 50 kilometre race for dirigible balloons for prizes value 10,000 francs. It was also suggested that 5,000 francs should be offered for a competition for man-lifting kites, but a race for spherical balloons will be organised instead on August 26th.

The Pilot of the "Silver Dart."—Mr. J. A. D. McCurdy, who has made the successful flights in this biplane, at the wheel of the flyer.

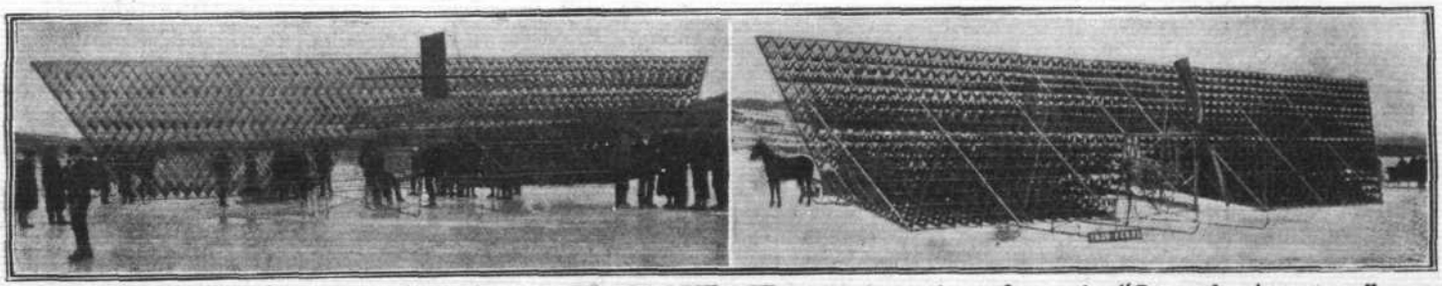
The French eliminating race for the Gordon-Bennett Cup will be held on Sunday, August 22nd, as well as a distance competition, which will also be continued on August 25th and 27th. On the 23rd and 29th there will be the speed events; the passenger competition on the 23rd, the circuit race on the 24th, and the altitude contest on the 29th. The Gordon-Bennett contest will be on the 28th August.

Anjou Aviation Week.

IT is announced unofficially that this big aeronautical week will take place during the early part of July.

"La Nature" 10,000 francs Prize.

CONDITIONS governing this prize are now issued by the L.N.A. It is to go to the first aviator in France who flies 100 kiloms., measured in a straight line, within two hours. The flight must be one of certain routes specified by the L.N.A. Machines must not be run along the roads, and the start and landing may only be effected at specified points after arrangements have been made with the proper authorities by the L.N.A.



THE GRAHAM-BELL TETRAHEDRAL AEROPLANE.—We reproduce above, from the "Scientific American," two views of the extraordinary aeroplane with which Dr. Graham Bell has been experimenting at Baddeck, N.S. On the left the apparatus is seen from the front, the vertical and horizontal rudders being prominent; while, on the right, the rear view of the machine shows the large wooden propeller, which is driven by an 8-cyl. Curtiss motor.

Wilbur Wright and Members of the Senate.

A NUMBER of the French Aviation Parliamentary Group travelled to Pau last week to witness Mr. Wright fly, and several had the gratification of actual flying experience. M. Joly, the Vice-President of the group, was indulged for 3 mins., and M. Breton, Deputy, for 5 mins. M. Tharel, of the Ariel Co., was up for 4 mins., and a final flight of 8 mins. with Capt. Gerardville brought the exhibition flights to a close.

Flying Taught in Two Hours.

SPEAKING to a *Daily Mail* representative on his arrival in Paris on Wednesday, Wilbur Wright gave it as his opinion that "an apt man, one who is quick at picking up things, can easily learn to fly in two hours. When I came to France I had not had more than four hours' experience in handling an aeroplane, and neither of my pupils, Comte de Lambert and M. Tissandier, had had more than six lessons of about twenty minutes each when they were able to fly alone."

A Pupil Flies 25 kiloms.

WHILE Wilbur Wright was making the above statement a telegram arrived from Pau giving the pleasing information that Comte de Lambert and M. Tissandier had successfully competed for the "beginners" prizes of the Aero Club of France, for a flight of 250 metres. This distance was easily accomplished, and the pupils went on until 25 kiloms. had been traversed, thus proving Wilbur Wright's contention that the tuition need not be a lengthy progress.

The Savary Flyer.

M. ROBERT SAVARY, an engineer, is having constructed at the Bollée works an aeroplane of the biplane type. A special system of "deformation" will be used in place of the warping of the planes on the Wright machine, and the new apparatus is said to offer a fresh solution of the problem of longitudinal stability. It is to be ready about the middle of next month, when it will be tried at Anvours Camp.

Farman's Machine at Vienna.

THE Voisin machine sold by Mr. Farman for work at Vienna has now been installed in the aero dock of the Military Balloon Corps, near the Arsenal. Legagneux will shortly be flying the machine, and a second Voisin machine will before long be at Vienna ready for demonstration use in some of the leading cities of Austria.

The de la Hault Flyer.

LAST week in referring to the de la Hault machine, by a slip of the pen, it is described as having been manufactured in France. This was, of course, incorrect, the builder being M. Jules Miesse, of Brussels, who is also the constructor of the cars bearing his name.

Auvergne and Aviation.

THE A.C. d'Auvergne is taking a good deal of interest in aviation, and has now formed a special section to deal with the subject, to organise conferences, exhibitions and competitions. It is proposed to have a contest for aeroplanes over a 400-kilom. course in the plain of Clermont-Ferrand, and another over a kilom. on the Laschamp Plain at the foot of the Puy de Dome. It is also proposed to have a coupe trial for dirigibles and a competition for carrier pigeons. In general the Club is determined to do all it can to stimulate interest in the matter of flight and the conquest of the atmosphere.

American to Fly Across the Channel.

FROM New York comes the news that the Aerial Experiment Association have made arrangements to send a biplane, similar to the "Silver Dart," to England in order to compete for the Cross-Channel prizes. It is said that the machine will be sent over in May, and that it will be in charge of Mr. J. A. D. McCurdy or Mr. F. W. Baldwin, both of whom have made successful flights on the "Silver Dart."

Aero Club of France Members, 1,000.

IT is announced that the membership of the Aero Club of France has this month passed the 1,000.

The Belgian Aero Club.

THE Belgian Aero Club have elected a Committee to deal with questions regarding dirigible balloons, and the Commandant Le Clement de Saint Marcq has been appointed Chairman. Count Hadelin d'Oultremont has been selected as Chairman of the Scientific Committee.

A Belgian Prize for Aero Motors.

A PRIZE of 1,000 francs has been offered by M. Adhémar de la Hault, to be awarded on August 1st, 1910, to the motors between 25 and 50-h.p., for aviation purposes, which shall have proved by brake tests to be the best.

"Zeppelin I" carries 26 Passengers.

No less than 26 passengers were carried by "Zeppelin I" during a four hours' voyage of over 150 miles at an altitude rising to 650 ft. over and around Lake Constance on Friday of last week. No perceptible difference was apparent from the extra weight, either in stability, speed, or lifting. Besides Count Zeppelin, there were on board seven officers of the Army Aeronautic Department, three non-commissioned officers and fifteen soldiers, comprising part of the "Zeppelin's" regular crew.

Prince Henry Lectures on the "Zeppelin."

ON Saturday last, before an appreciative audience, Prince Henry of Prussia gave a lecture descriptive of his experiences during a trip on the Zeppelin airship. Prince Henry went fully into the details as to the dimensions and cost of "Zeppelin I," and came to the conclusion that such an airship would be very expensive, and its achievements would be hardly proportionate to its cost. Despite its size, the airship is so sensitive that when a member of the crew wishes to change cars, another man has to leave the car at the end, and they pass at the middle of the gangway connecting the two. Messages are written down and conveyed from one car to another along an endless wire. According to Prince Henry, the "Zeppelin" answers to the helm as easily as a steam pinnace, and that it bears against the wind in a similar way to a sailing vessel against the tide. He thought the noise of the propellers a serious disadvantage, as it might betray the presence of the airship in war time.

The problem of reaching a fixed point, not too far distant, was solved, but he gave four reasons why dirigible airships were not, at present, suited for regular means of communication or for military purposes. Firstly, very little was known about air currents. Secondly, there was the difficulty of making headway against strong winds. Thirdly, too much depends upon atmospheric disturbances, and, fourthly, the motors were not capable of making very long journeys. The altitude which could be attained was also limited, as at great

heights the propellers found less resistance, and the decrease in oxygen affected the motors. Spherical balloons would always be an essential preliminary school for experiments with dirigibles.

The "Bank" and Airships.

AT the meeting of the proprietors of the Bank of England, on Thursday of last week, a query was anxiously addressed to the chairman as to the vulnerability of the "old lady of Threadneedle Street" should an airship hover above the Bank of England, and, by way of announcing its presence, drop a projectile or two. Would the vaults holding the bullion be sufficiently strong to withstand such attentions? The question proved too much for the chairman, who was unable to answer, as he confessed he was ignorant of the risk.

An "expert" has since come to the rescue, however, and shown that the gold reserve of £40,000,000 would prove a somewhat awkward bundle of "swag" to fly away with. The weight of this amount of gold would be somewhere about 320 tons, and he estimates that it would require a fleet of 1,000 huge dirigibles, each capable of carrying 1,000 pounds weight, and assuming each dirigible cost £5,000, the capital involved in the predatory expedition would be about five million pounds. Further according to the expert, if aeroplanes were used, 4,000 would be required, as they cannot carry much more than 250 lbs., and such a huge fleet, he incidentally suggests, might find difficulty in obtaining garage accommodation just now.

Another North Pole Expedition.

COMMUNICATIONS have been received at Copenhagen from Prof. Nitzsche, of Pennsylvania University, relating to a North Polar expedition, which is to leave Spitzbergen in July next. The expedition, it is stated, will consist of six persons with three balloons, or two balloons and a dirigible.

Dirigible Shed at Frescati.

AT Frescati, near Metz, work is in progress on the construction of an enormous airship shed destined for the accomodation of German military dirigibles.

Gordon-Bennett Balloon Race.

IT is announced that the start of this race from Zurich has been definitely fixed for October 10th.

GERMANY'S AIRSHIPS AND PARLIAMENT.

ON Wednesday in the House of Commons, Mr. Lea asked the Prime Minister whether his attention had been drawn to the performance of the "Zeppelin I" on the 19th inst., when it carried twenty-six men during a four-hour trip; whether he was aware that, according to official statements, the German Admiralty and War Office were now building, and would have in 1910, 24 such airships; and could he assure the House that this matter was engaging the attention of our naval and military authorities.

In reply, Mr. Asquith said that the whole question of aerial navigation has for some time past occupied the attention of the Defence Committee and of the Government, and provision has been made both in the Army and Navy Estimates which will ensure that the problems connected with the use of airships in maritime as well as in land warfare will be fully investigated by both the departments concerned. The Government have no official information that corroborates or otherwise the statement of fact contained in the question.

A BRITISH "MICHELIN CUP."

As will be seen from the Aero Club official notes this week, and the letter hereunder, the Michelin Tyre Co. have made another magnificent offer for the encouragement of flight, this time in Great Britain. They have offered a Trophy, of a value of £500, carrying with it a sum of £500 annually for five years. The competition for this new prize will be limited to British subjects manipulating a British-built machine. The control is entirely in the hands of the Aero Club of the United Kingdom, who are now drawing up the regulations, which will be published as soon as possible.

The following is the full text of the letter from the Michelin Tyre Co., addressed to the Aero Club of the United Kingdom, making the offer:—

The prizes offered by Messrs. Michelin et Cie. have been the cause of such undoubted progress in the science and practice of aviation in France, that we have come to the conclusion that by offering a cup for flying machines heavier-than-air the Michelin Tyre Co. would contribute in a very large measure to the development of aviation in this country.

The connection between aviation and automobilism is greater than it appears to be at first sight. If the development of aviation is advanced, the manufacturers are led to build lighter engines, and the reduction in the weight of the cars would result in a reduction in the cost of automobilism, and, in consequence, increase its popularity. This has always been the first aim of each Michelin Company, in whatever country it has been established.

For this reason, we have decided to offer a Trophy, represented by a work of art, of the total value of £500, which will carry with it annually a sum of £500 for a term of five years. This Cup will be known as the "English Michelin Cup," and will be competed for under the following conditions:

Prior to April 30th in each year, your Club should draft, settle, and issue the conditions of the competition to be open until March 31st of the following year; you should then determine the length and conformation of the course, which should be a closed circuit, the character and dimensions of the curves, the ascensional heights and other general regulations for governing and controlling the conduct of each attempt.

The conditions should be approved by the Michelin Tyre Co.

The holder of the Cup for the first year shall be the aviator who, before sunset on March 31st, 1910, shall have flown the greatest distance, on a course established in the United Kingdom in accordance with the conditions laid down.

The distance in each succeeding year to provide a record should be double that of the record established by the previous winner, until the total distance covered has reached 250 miles. Thereafter, the Club will decide with the Michelin Tyre Co. upon the conditions which shall subsequently obtain.

The Michelin Tyre Co., being a British concern, with established works in this country, we make it an essential condition that the Cup can only be won by a Briton, manipulating a British-made machine.

We shall be happy to place the said Trophy in the hands of your Club. It will remain the Club's property.

The holder of the annual Cup will receive a facsimile of the Trophy, together with a sum of £500, which will be paid to him within thirty days after the confirmation of his record by the Club.

Should the Cup not be won in any one year, the £500 endowment of that year shall be added to that of the year following.

The trials will be held under the control of the Aero Club of the United Kingdom.

ELECTRIC WELDING FOR AEROPLANES.

By G. CROSLAND TAYLOR, F.R.G.S.

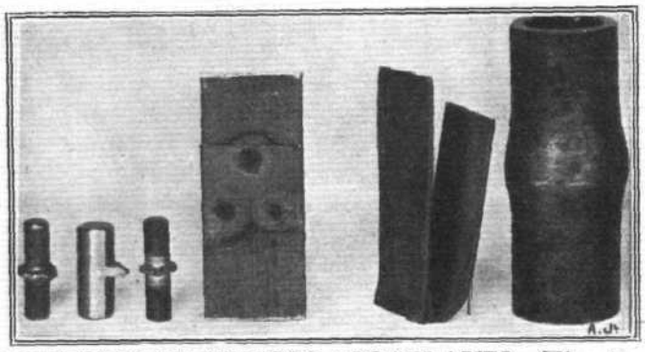
No process could be better adapted for joining up of the frame-members of an aeroplane than welding, for in aerial work lightness in conjunction with strength is everything, and there is no better way to secure this in a joint than with a bond formed by the fusion of the two pieces of metal. In all departments of engineering, welding is among the most important of the many workshop processes, and it is in fact one of the oldest arts in existence. When performed by hand, however, welding is seldom an easy, and often a very difficult operation, so that more often than not it is expensive to perform, and has therefore led to the introduction of substitutes.

Since the introduction of electricity, however, the art of welding has been revolutionised, compared with the little progress which was made during the previous thousand years or so. Welding, as was explained above, involves the fusion of two separate pieces of metal, and electric welding, as its name implies, involves the accomplishment of that fusion by means of the electric current. In ordinary hand-welding, two bars of iron which have to be joined together are heated simultaneously in the fire, overlapped, and hammered together on the anvil so as to ensure the necessary contact between the two pieces of metal while they are at welding heat. If the smith fails to appreciate when the proper temperature has been reached his work is wasted, likewise often enough the material also; and if he is not skilled in making the joint his labours will again be futile. Although a process of fusion—which implies that the metal surfaces run together of their own accord—welding is rendered difficult by the formation of an oxide or scale upon the surface, which insulates the surfaces from one another, and thus prevents the process of fusion taking place. In order to dissolve the scale, flux is used, and in order to get rid of the combined flux and the scale from the surface of the metal, the two pieces are hammered together so as to squeeze out the foreign matter, and thereby bring the actual metal itself into direct contact. The hammering has nothing to do with making the joint so far as the actual force of the blow is directly concerned.

In electric welding, the heat of the furnace is replaced by the heat of the electric current, or of the electric arc—the processes are different—and the two members to be welded together are forced into contact before the heat is generated, and, therefore, do not need to be hammered. The convenience of being able to raise the necessary temperature while the pieces are exactly in position, and the advantages of obtaining the necessary temperature right in the body of the metal itself instead of by external application, are sufficiently obvious to be appreciated by everyone, whether familiar with engineering processes or not. The capacity of the electric current for generating heat is an everyday phenomenon which can be witnessed in the household electric lamp. The reason that the filament of an electric lamp emits light is because it is made white-hot, and the reason that it is made white-hot is because it offers very considerable resistance to the passage of the electric current.

Of the various devices which offer a high resistance to the passage of electric current, none is simpler or more effective than the air. Bad contacts in switches and elsewhere in electrical circuits give trouble by overheating, because they fail to completely exclude the air from between their surfaces. The air is an insulator, and cuts off the current between those parts of the surface separated by it, thus causing a greater flow between those other parts of the "contact" where the metal surfaces really do touch each other. In electric welding the members to be joined together are placed in position relatively to one another, and are mounted in a machine so that the joint between them completes an electric circuit. A very large current of electricity is then switched on, and in a short while the surfaces in contact begin to get very hot. As the temperature increases, so does the metal become softer and softer, until finally it begins to run together, when the fusion is complete.

That is one method of electric welding; it is especially suited to the joining of tubes and rods, which joints, it will be obvious from the above description, are effected without the use of lugs or brackets, and are, therefore, as light as it is possible to make them. There is also another system of electric welding called "spot" welding, which is a more recent invention, and is designed to replace riveting as a means of joining together plates and sheets of metal. The perfection of a riveted joint depends very largely on the completeness with which the



ELECTRIC WELDING FOR AEROPLANES.—The above illustration shows various samples of electric welding. On the left are three rods which have been welded end to end; the middle specimen has had part of the surplus metal removed. The flat strips are examples of spot welding, while the tube is another example of end-to-end welding.

rivet is made to replace the metal which was cut away to form the rivet hole. In spot welding there is no rivet hole, but there is what may be reasonably claimed to be a perfect rivet, as the original metal is left intact, and yet its continuity from plate to plate has been effected.

The principle of spot welding is just the same as the end-to-end welding already described, only in this case a device is arranged whereby the electricity passes through the two surfaces in contact at a certain spot only, and thus causes a fusion of the metal to take place there and nowhere else. Repeating the process at intervals over the surfaces which are to be joined together, the effect produced is obviously similar to that which has hitherto been accomplished by riveting, only in this instance it is the original metal which is employed to make the joint. Large or small rivet spots can, of course, be fused, according to the type of machine which is employed for the purpose. Like most other modern processes it is necessary to have proper machinery for the work, and to specialise in it, if good results are to be ensured. Neither is the success of these methods limited to the welding of iron and steel; on the contrary, it is particularly successful with copper and alloys, besides affording a means of satisfactorily welding aluminium wires, rods, &c., without developing any weakness in the material used.

Flight

PRESENT STATUS OF MILITARY AERONAUTICS.

By GEORGE O. SQUIER, Ph.D., Major, Signal Corps, U.S. Army.

(*Continued from page* 167.)

SOME GENERAL CONSIDERATIONS WHICH GOVERN THE DESIGN OF A DIRIGIBLE BALLOON.

Buoyancy and Shape.

Although many aerodynamic data are needed for the proper design of a dirigible airship, yet the experience already available in the construction and performance of such ships built on different plans is sufficient to enable the engineer to proceed with the design of a dirigible balloon to accomplish definite results along fairly accurate lines. In the case of this class of lighter-than-air ships the following general equation obtains:— $W - w = V\left(\sigma - \frac{\sigma}{n}\right)$ (1)

where

W = weight of balloon, envelope, car, and aeronauts;
V = volume of balloon;
σ = density of the air;
n = density of air as compared with gas;
w = weight of air displaced by car and aeronauts and envelope of balloon.

If we call the weight of the gas in the balloon M, then we can write this equation in the following manner:— $W + M = w + nM$

from which we find that $M = \frac{W - w}{n - 1}$ (2)

and $V = \left(\frac{W - w}{\sigma}\right)\left(\frac{n}{n - 1}\right)$ (3)

thus obtaining the volume of gas required. If the volume of the gas-bag, car, aeronauts, &c. $= v$, then $w = v\sigma$; so that (3) may be written $V = \left(\frac{W - v\sigma}{\sigma}\right)\left(\frac{n}{n - 1}\right)$ (4).

Thus far, certainly, no dirigible balloon has ever been developed which has attained an independent speed greater than 40 m.p.h. It will be readily admitted that an airship so designed as to reach a speed of 50 or 60 m.p.h. would be regarded as a most decided step forward in the art, since this difference of velocity is just the increment needed to place such craft on a practical basis, capable of manœuvring in the air in all ordinary weather. This advancement, although requiring much consideration, would fully compensate in practical results.

The first point to be decided upon in the design of an airship is the method of maintaining the shape of the gas-bag against the pressure encountered at the maximum velocity to be attained. There are two schools of design in this respect, each having its adherents. One maintains the shape of the gas-bag by a rigid interior frame, and the other by means of the internal pressure of the gas itself.

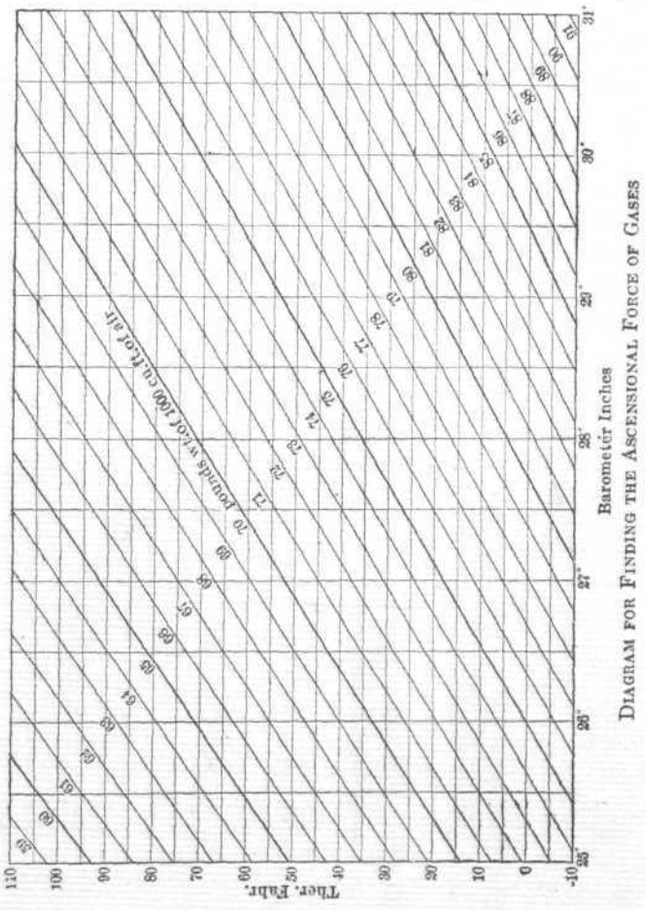


DIAGRAM FOR FINDING THE ASCENSIONAL FORCE OF GASES

Upon the selection of the type depends to a large extent the particular shape of the envelope. If the envelope is to maintain its shape by interior pressure of gas, evidently it must be so designed that the maximum pressure of the air developed at the speed contemplated shall not be sufficient as to cause deformation of any part of the envelope. This can be effected only by making the uniform internal pressure at least equal to the maximum external pressure. Since the maximum external pressure occurs over the prow of the airship, this evidently is the particular part which must receive most careful attention with this system.

The desirable shape of head would evidently be one where the distribution of external pressure due to air resistance at the velocity used in uniform. In addition to preventing deformation of the gas-bag, a prime requisite also is that the shape shall be such that the total resistance, comprising head-resistance and skin-friction, shall be a minimum for a given displacement and velocity.

This immediately forces the question of the law of resistance of the air. On this subject there are numerous aerodynamic data for low velocities, and also for very high velocities, but such data are incomplete for the range of velocities here considered.

In fact, the law of resistance of the air for services of revolution as experimentally determined, is known to vary, not with any constant power of the velocity, but by a range of exponents from the first to the cube, if not higher. For example, in the enormous velocities attained by modern artillery, where bodies, weighing a ton or more, are hurled through the air at 2,000 ft. per second, it is known that the physical phenomena become entirely different in nature from those found when dealing with moderate velocities such as are met in transportation devices.

Resistance of the Air to the Motion of a Projectile.

In the expression for the retardation of oblong projectiles the velocity enters with an exponent, n, whose accepted values are as follows:—

		Ft. per second.	Miles per hour.
$n = 1{\cdot}55$	for velocities greater than	2600 =	1773
$n = 1{\cdot}7$	,, between	2600 and 1800 =	1773 and 1227
$n = 2$	,, ,,	1800 ,, 1370 =	1227 ,, 934
$n = 3$	,, ,,	1370 ,, 1230 =	934 ,, 836
$n = 5$	,, ,,	1230 ,, 970 =	836 ,, 639
$n = 3$	,, ,,	970 ,, 790 =	639 ,, 592
$n = 2$	,, less than	790 =	592

14-in. and 16-in. Guns.—The 14-in. guns fire a projectile weighing 1,660 lbs. Service muzzle velocity 2,150 f.s., which gives, with an elevation of 15°, a range of 15,000 yds.

The 16-in. guns fire a projectile weighing 2,400 lbs. The Service muzzle velocity is 2,150 f.s., or 1,465 miles per hour, which gives, for an elevation of 15°, a range of 15,558 yds., or nearly 9 miles.

Analogy to Airship.

Great guns are now constructed which throw masses of steel weighing as high as 2,400 lb. to maximum distances approximating 15 to 20 miles, and with such high momentum that ordinary winds have little effect, as shown by the remarkable target practice of the Army and Navy. The shapes of these heavier-than-air flying machines are figures of revolution, and the longitudinal and lateral stability are maintained by imparting to the projectile a rotary motion about its longer axis by means of the rifling inside the bore of the gun. Such machines are 5,000 or 6,000 times heavier than air and travel at speeds far beyond any other engine constructed by man. No pheripheral speeds attained with any machinery approach these velocities.

It is noted that these projectile air-machines have a mass two and a half times that of the Wright aeroplane, and attain a velocity through the air thirty-six times as great.

It thus appears that the resistance of the air to the motion of bodies through it is in reality a complicated function of the velocity, and the best that can be said is that this velocity varies as a constant power only within certain limited ranges. In the velocities considered for airships, it is approximate to regard the resistance as varying as the square.

As the velocity increases the form of the head becomes more and more important, and moderate velocities lead to a shape approxi-

mating torpedo form, which is well known. In very high speed projectiles the shape of the rear is not so important, since the velocity is so much greater than the velocity of sound in air, that a partial vacuum is formed behind the projectile which cannot well be obviated.

If the rigid system be employed where an internal frame prevents deformation of the envelope, the stresses due to external pressure are taken up by the framework itself, and the gas required for flotation is usually contained in several separate receptacles or ballonettes similar to compartments employed in ships. In this system, therefore, we are concerned only in securing such a shape of the rigid frame as will fulfil the condition of minimum total resistance for a given displacement and velocity.

Once the shape of the bag is determined from the considerations already enumerated, the dimensions become immediately fixed when the tonnage is assumed, or conversely, if any linear dimension is assigned the tonnage is thereby determined.

In addition to the two general systems above considered, there are various types involving some of the principles of each, which are classed in general as semi-rigid systems. Such systems usually comprise a rigid frame, to which is attached the gas-bag above, and the load below.

Aerodynamic Adjustments.

The next step is one of structural design along strictly engineering lines. The aerodynamic features of airship construction may be considered under the heads: (*a*) static balance; (*b*) dynamic balance; (*c*) stability; (*d*) natural period and oscillation.

Static Balance.—The dimensions of the gas-bag being determined, the lift of each transverse segment thereof is immediately known, and the design of the frame may proceed by approximate trial and correction as in other structural work. The weight of each segment of the envelope itself is readily computed, which added to the corresponding segment of the frame gives the total weight of each segment, and this total subtracted from the lift of each segment gives the net lift for that complete segment. From the magnitude and position of these net forces the position of the resultant lift is known, and this determines the vertical line through the centre of gravity. Such procedure evidently insures static balance of the machine as a whole, and an approximate distribution of the load.

Dynamic Balance.—The dynamic balance must also be carefully considered; and here a difficulty has been experienced on account of the inability to place the resultant thrust coincident with the line of resistance of the ship as a whole. Heretofore, it has been customary to balance the thrust-resistance couple by means of suitable horizontal rudders or planes, so situated and at such angles that the resultant moment of the system should be zero at uniform speeds of travel, though not necessarily zero for accelerated motion.

If, however, the line of thrust be made coincident with the line of resistance, the disturbing moment in question will be eliminated at uniform speeds. If, furthermore, the centre of mass be located on the line of thrust and sufficiently forward to form a righting couple with the resistance when the wind suddenly veers, the evil effects of a disturbing moment will be obviated for variable as well as for constant speeds. The ship is then dynamically balanced.

This, of course, requires that the form of hull be such that a quartering wind shall exert a force passing to the rear of the centre of mass. To illustrate, a good example of dynamic balance is found in a submarine torpedo or a fish.

Stability.—The foregoing adjustments still allow the centre of mass to be placed below the centre of buoyancy. This is a provision that is important in aeronautics as well as in marine architecture, indeed it is the only practical provision for keeping an even keel and preventing heeling when the ship is at rest, or simply drifting with the wind. If the centre of gravity be well below the centre of buoyancy, the vessel is proportionately stable, but, of course, the stability is pendular, and may admit of considerable rolling and pitching due to shifting loads, sudden gusts of wind, &c., unless special devices are used to dampen or prevent these effects.

Natural Period and Oscillations.—It may also happen that the equilibrium of the ship is disturbed by periodic forces whose periods are simply related to the natural period of the ship itself. In this case the oscillations will be cumulative and may become very large. Such effects are well known to marine engineers, and may be treated as in ordinary ship design.

(*To be continued.*)

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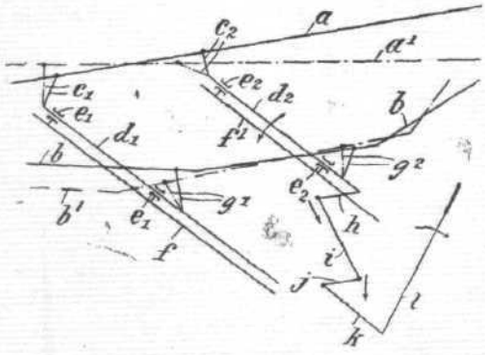
BRITISH PATENT SPECIFICATIONS. Selected and Abridged by James D. Roots, M.I.Mech.E., Thanet House, Temple Bar, London.

The first date given is the date of application; the second at the end, the date of the advertisement of the acceptance of the complete specification.

28028. December 23rd, 1908. Improvements in Aeroplanes. R. Esnault-Pelterie, of 149, rue de Silly, Billancourt, Seine, France. This improvement in aeroplanes consists in a mode of positively deforming the vanes for the purpose of curving them to preserve transverse equilibrium. The method consists essentially in determining the relative inclination to each other of the front beam and the rear beam, between which is stretched the textile material which constitutes the deformable surface of the vanes, without deforming, that is to say, without curving the beams. *a* is the front beam, and *b* the rear beam, these being connected by ribs, and having the fabric or deformable material which constitutes the surface of the wings stretched between them. The front beam is articulated to two arms, c^1, c^2, converging upwards, and the rear beam, *b*, is articulated to arms g^1, g^2, diverging upwards. Arms, c^1 and g^1, are keyed at their lower end to a shaft, d^1, mounted in bearings, e^1, fixed to a frame-plate, *f*, of the aeroplane. In like manner arms, c^2 and g^2, are keyed to a shaft, d^2, turning in bearings, e^2, fixed to the frame-plate, f^1. On the end of the right-hand axle, d^2, for example, is keyed a small horizontal arm, *h*, jointed to an oblique connecting-rod, *i*, which is pivoted at its other end to a small horizontal arm, *j*, keyed on a spindle, *k*, on which is also fixed a hand-lever, *l*. It is the object of this transmission to rotate the shafts,



d^1, d^2, in the direction the reverse of that in which the hand-lever, *l*, is turned, so as to correct the transverse equilibrium by inclining the lever, *l*, to the side on which the apparatus is elevated. If, for example, lever *l* is inclined in the direction of the arrow, owing to the system of transmission reversing the direction of rotation, namely, the arm, *j*, the connecting-rod, *i*, and the arm, *h*, the axle, d^2, turns in the direction the reverse of that of the lever, *l*, and therefore the connecting arms, c^2, g^2, and together with them the arms, c^1, g^1, and the axle, d^1, are similarly turned. Owing to the convergence of arms c^1, c^2, the front beam, *a*, takes the position indicated in dotted lines, a^1, becoming lowered towards the right and raised towards the left hand, while the rear beam, *b*, takes the reverse position, shown in dotted lines, b^1, becoming raised towards the right hand and lowered towards the left hand, so that the inclination of the right-hand side is considerably diminished, while that of the left hand is notably increased.—March 3rd, 1909.

Aeronautical Patents.

Applied for in 1908.

Published April 1st, 1909.

21,092. TRIBELHORN. Airships.

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CORRESPONDENCE.

FLYING MACHINE CRITICISM.

To the Editor of FLIGHT.

SIR,—I am one who rather agrees with Mr. E. Wilson's criticism of the aeroplane. While admiring Messrs. Wright, Farman, Brabazon, and others in pursuing the perfection of the aeroplane machine, we cannot shut our eyes to its inherent defects. The Wright machine, while it shows fully what can be done with an aeroplane type of machine, also makes it quite clear what it cannot do.

However much the aeroplane may be admired, it cannot be claimed that it has solved the problems of mechanical flight, or that it is ever likely to entirely satisfy the aeronautical engineer, and critics like Mr. E. Wilson are necessary and salutory, and stimulating in a new industry, in which so little has been accomplished, and so much room for improvement remains.

The time for dreaming and inventing is by no means past because a few aeroplanes have made brief flights under exceptionally favourable circumstances that will not prevent others looking for something much better.

And although the laws and facts and figures of aeronautics are well known, their practical application to actual designs and construction, and the invention of mechanisms to carry them into effect, are all in the future.

At present the men with money have made a rush for aeroplanes only, and have left the real developments along other lines to inventors who cannot get a hearing. I venture to say that the Wright aeroplane performances show about the best that may be expected of aeroplanes, and that further research on that machine is only wasting time and money.

Mr. E. C. Dwyer's dictum that a critic should not criticise anything done until he can do it better, or as well, himself, is rather a startling limitation; where would critics of art come in.

The aeroplane is all very well, and will lead on to other types still better, but to claim for it any degree of finality in flying machines will retard the progress in aeronautics in general.

Glasgow. RANKIN KENNEDY.